

2024 CFA®
Exam Prep

SchweserNotes™

Portfolio Management and Ethical
and Professional Standards

LEVEL II BOOK 5

KAPLAN SCHWESER

Book 5: Portfolio Management and Ethical and Professional Standards

SchweserNotes™ 2024

Level II CFA®

KAPLAN  **SCHWESER**

SCHWESERNOTES™ 2024 LEVEL II CFA® BOOK 5: PORTFOLIO MANAGEMENT AND ETHICAL AND PROFESSIONAL STANDARDS

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CONTENTS

Learning Outcome Statements (LOS)

PORTFOLIO MANAGEMENT

READING 35

Exchange-Traded Funds: Mechanics and Applications

Exam Focus

Module 35.1: ETF Mechanics and Tracking Error

Module 35.2: Spreads, Pricing Relative to NAV, and Costs

Module 35.3: ETF Risks and Portfolio Applications

Key Concepts

Answer Key for Module Quizzes

READING 36

Using Multifactor Models

Exam Focus

Module 36.1: Multifactor Models

Module 36.2: Macroeconomic Factor Models, Fundamental Factor Models, and Statistical Factor Models

Module 36.3: Multifactor Model Risk and Return

Key Concepts

Answer Key for Module Quizzes

READING 37

Measuring and Managing Market Risk

Exam Focus

Module 37.1: Value at Risk (VaR)

Module 37.2: Using VaR

Module 37.3: Sensitivity and Scenario Risk Measures

Module 37.4: Applications of Risk Measures

Module 37.5: Constraints and Capital Allocation Decisions

Key Concepts

Answer Key for Module Quizzes

READING 38

Backtesting and Simulation

Exam Focus

Module 38.1: Introduction to Backtesting

Module 38.2: Backtesting an Investment Strategy

Module 38.3: Metrics, Visuals, and Problems in Backtesting

Module 38.4: Scenario Analysis and Sensitivity Analysis

Key Concepts

Answer Key for Module Quizzes

READING 39

Economics and Investment Markets

Exam Focus

Module 39.1: Valuation and Interest Rates

Module 39.2: The Business Cycle

Key Concepts

Answer Key for Module Quizzes

READING 40

Analysis of Active Portfolio Management

Exam Focus

Module 40.1: Value Added by Active Management

Module 40.2: The Information Ratio vs. the Sharpe Ratio

Module 40.3: The Fundamental Law

Module 40.4: Active Management

Key Concepts

Answer Key for Module Quizzes

Topic Quiz: Portfolio Management

ETHICAL AND PROFESSIONAL STANDARDS

READINGS 41 & 42

Code of Ethics and Standards of Professional Conduct and Guidance for Standards I–VII

Exam Focus

Module 41.1: Introduction to the Code and Standards

Module 42.1: Standards I(A) and I(B)

Module 42.2: Standards I(C) and I(D)

Module 42.3: Standards II(A) and II(B)

Module 42.4: Standard III(A)

Module 42.5: Standards III(B) and III(C)

Module 42.6: Standards III(D) and III(E)

Module 42.7: Standards IV(A), IV(B), and IV(C)

Module 42.8: Standard V

Module 42.9: Standard VI

Module 42.10: Standard VII

Key Concepts

Answer Key for Module Quizzes

READING 43

Application of the Code and Standards: Level II

Exam Focus

Module 43.1: Ethics Case Studies

Topic Quiz: Ethical and Professional Standards

Formulas
Index

Learning Outcome Statements (LOS)

35. Exchange-Traded Funds: Mechanics and Applications

The candidate should be able to:

- a. explain the creation/redemption process of ETFs and the function of authorized participants.
- b. describe how ETFs are traded in secondary markets.
- c. describe sources of tracking error for ETFs.
- d. describe factors affecting ETF bid-ask spreads.
- e. describe sources of ETF premiums and discounts to NAV.
- f. describe costs of owning an ETF.
- g. describe types of ETF risk.
- h. identify and describe portfolio uses of ETFs.

36. Using Multifactor Models

The candidate should be able to:

- a. describe arbitrage pricing theory (APT), including its underlying assumptions and its relation to multifactor models.
- b. define arbitrage opportunity and determine whether an arbitrage opportunity exists.
- c. calculate the expected return on an asset given an asset's factor sensitivities and the factor risk premiums.
- d. describe and compare macroeconomic factor models, fundamental factor models, and statistical factor models.
- e. describe uses of multifactor models and interpret the output of analyses based on multifactor models.
- f. describe the potential benefits for investors in considering multiple risk dimensions when modeling asset returns.
- g. explain sources of active risk and interpret tracking risk and the information ratio.

37. Measuring and Managing Market Risk

The candidate should be able to:

- a. explain the use of value at risk (VaR) in measuring portfolio risk.
- b. compare the parametric (variance-covariance), historical simulation, and Monte Carlo simulation methods for estimating VaR.
- c. estimate and interpret VaR under the parametric, historical simulation, and Monte Carlo simulation methods.
- d. describe advantages and limitations of VaR.
- e. describe extensions of VaR.
- f. describe sensitivity risk measures and scenario risk measures and compare these measures to VaR.
- g. demonstrate how equity, fixed-income, and options exposure measures may be used in measuring and managing market risk and volatility risk.
- h. describe the use of sensitivity risk measures and scenario risk measures.
- i. describe advantages and limitations of sensitivity risk measures and scenario risk measures.
- j. explain constraints used in managing market risks, including risk budgeting, position limits, scenario limits, and stop-loss limits.
- k. explain how risk measures may be used in capital allocation decisions.
- l. describe risk measures used by banks, asset managers, pension funds, and insurers.

38. Backtesting and Simulation

The candidate should be able to:

- a. describe objectives in backtesting an investment strategy.
- b. describe and contrast steps and procedures in backtesting an investment strategy.
- c. interpret metrics and visuals reported in a backtest of an investment strategy.
- d. identify problems in a backtest of an investment strategy.
- e. evaluate and interpret a historical scenario analysis.
- f. contrast Monte Carlo and historical simulation approaches.
- g. explain inputs and decisions in simulation and interpret a simulation.
- h. demonstrate the use of sensitivity analysis.

39. Economics and Investment Markets

The candidate should be able to:

- a. explain the notion that to affect market values, economic factors must affect one or more of the following: 1) default-free interest rates across maturities, 2) the timing and/or magnitude of expected cash flows, and 3) risk premiums.
- b. explain the role of expectations and changes in expectations in market valuation.
- c. explain the relationship between the long-term growth rate of the economy, the volatility of the growth rate, and the average level of real short-term interest rates.
- d. explain how the phase of the business cycle affects policy and short-term interest rates, the slope of the term structure of interest rates, and the relative performance of bonds of differing maturities.
- e. describe the factors that affect yield spreads between non-inflation-adjusted and inflation-indexed bonds.
- f. explain how the phase of the business cycle affects credit spreads and the performance of credit-sensitive fixed-income instruments.
- g. explain how the characteristics of the markets for a company's products affect the company's credit quality.
- h. explain the relationship between the consumption hedging properties of equity and the equity risk premium.
- i. explain how the phase of the business cycle affects short-term and long-term earnings growth expectations.
- j. describe cyclical effects on valuation multiples.
- k. describe the economic factors affecting investment in commercial real estate.

40. Analysis of Active Portfolio Management

The candidate should be able to:

- a. describe how value added by active management is measured.
- b. calculate and interpret the information ratio (ex post and ex ante) and contrast it to the Sharpe ratio.
- c. describe and interpret the fundamental law of active portfolio management, including its component terms—transfer coefficient, information coefficient, breadth, and active risk (aggressiveness).
- d. explain how the information ratio may be useful in investment manager selection and choosing the level of active portfolio risk.
- e. compare active management strategies, including market timing and security selection, and evaluate strategy changes in terms of the fundamental law of active management.
- f. describe the practical strengths and limitations of the fundamental law of active management.

41. Code of Ethics and Standards of Professional Conduct

The candidate should be able to:

- a. describe the six components of the Code of Ethics and the seven Standards of Professional Conduct.
- b. explain the ethical responsibilities required of CFA Institute members and candidates in the CFA Program by the Code and Standards.

42. Guidance for Standards I–VII

The candidate should be able to:

- a. demonstrate a thorough knowledge of the CFA Institute Code of Ethics and Standards of Professional Conduct by applying the Code and Standards to specific situations.
- b. recommend practices and procedures designed to prevent violations of the Code of Ethics and Standards of Professional Conduct.

43. Application of the Code and Standards: Level II

The candidate should be able to:

- a. evaluate practices, policies, and conduct relative to the CFA Institute Code of Ethics and Standards of Professional Conduct.
- b. explain how the practices, policies, and conduct do or do not violate the CFA Institute Code of Ethics and Standards of Professional Conduct.

READING 35

EXCHANGE-TRADED FUNDS: MECHANICS AND APPLICATIONS

EXAM FOCUS

This topic review covers introductory material on ETFs. Be able to describe costs, risks, and sources of tracking risk for ETFs, as well as sources of discount/premium relative to NAV. Portfolio management applications of ETFs should be well understood.

MODULE 35.1: ETF MECHANICS AND TRACKING ERROR



Video covering
this content is
available online.

Exchange-traded funds (ETFs) represent shares in an index-tracking (i.e., benchmark) portfolio that trades on secondary markets. While similar to mutual funds, significant differences remain with respect to costs and taxation. While most ETFs are based on direct investments in underlying securities, ETFs can also utilize derivatives, invest via American depositary receipts (ADRs), or use leverage. The issuer (i.e. sponsor or manager) of the ETF allocates the portfolio based on the stated index/style and stands ready to redeem or create new shares in kind.

LOS 35.a: Explain the creation/redemption process of ETFs and the function of authorized participants.

Unlike open-end mutual funds, ETFs are traded on secondary markets. Therefore, when a shareholder wants to cash out, the shareholder sell his shares at the exchange where the ETF is traded; the ETF issuer is not involved in this transaction.

The ETF issuer designates **authorized participants (APs)**. APs are large broker-dealers that make the market in that ETF as primary market participants. APs are permitted to create additional shares, or redeem existing shares, for a service fee payable to the ETF manager. This creation/redemption process is in-kind: APs deliver a basket of securities (which may include cash) to the issuer in exchange for a number of ETF shares. They may also redeem ETF shares for a basket of securities. The ETF manager publicly discloses the list of required in-kind securities, known as the **creation basket**, each business day. The creation basket serves as a key input in determining the net asset value (NAV) of the ETF. A related term is the **redemption**

basket, which is the specific assortment of securities that the AP receives upon redeeming an ETF share.

The lot size in these primary market transactions is the **creation** unit; an ETF issuer specifies the size of a block of ETF shares (commonly 50,000) that can be traded as part of this creation/redemption process.

The in-kind creation/redemption process serves three purposes:

1. *Lower cost:* The creation/redemption process does not force the ETF manager to sell/purchase portfolio investments; the manager does not incur any resulting transaction cost. The ETF manager usually collects a service charge from the AP to cover any incidentals.
2. *Tax efficiency:* A major benefit of the in-kind creation/redemption process is that it is not a taxable event. For a mutual fund, liquidity needs for redemption are often met by the fund manager by selling some of the fund's holdings, which triggers transaction costs as well as potential capital gains taxes. These costs are borne by all the shareholders of the fund (including those that did not redeem shares). Additionally, ETF managers can choose to publish customized redemption baskets, allowing them to target low-basis stocks that will be part of the redemption basket. This increases the tax efficiency (i.e., increases the basis) of the remaining holdings of the ETF.
3. *Keeping market prices in line with NAV:* APs will engage in arbitrage transactions if the ETFs trade at a price significantly different from their NAV. If the ETF trades at a premium, APs can sell the ETF, purchase the creation basket, and recreate those shares. Similarly, if the ETF trades at a significant discount to NAV, the APs can purchase the ETF and redeem the shares.

It should be noted that APs incur transaction costs in creating the creation basket (or selling the redemption basket) in addition to any service fees that the ETF manager charges for creation/redemption. This implies that ETFs should trade within a price band of the NAV, known as the **arbitrage gap**. Because the liquidity of the securities in the basket determines the transaction cost, the arbitrage gap tends to be wider for ETFs with illiquid holdings. Due to difference in time zones, an ETF on a foreign index may exhibit a difference between its NAV and the last closing price when the foreign market was open. This timing difference increases risk for the AP, leading to a wider arbitrage gap. Similarly, ETFs with underlying illiquid securities (e.g., corporate bonds) would also have a wider arbitrage gap, because of the market risk borne by the AP during the time it takes to complete the trade.

APs pass on these costs in the form of bid-ask spreads on ETFs, which means that only transacting shareholders pay these costs, unlike with mutual funds where all shareholders bear this cost. Similarly, unlike mutual funds, ETFs are *tax fair* because redemptions are in kind and do not affect the nontransacting shareholders.

LOS 35.b: Describe how ETFs are traded in secondary markets.

ETFs trade on secondary markets just as stocks do. In the United States, the **National Security Clearing Corporation (NSCC)** guarantees the performance of parties to a trade on an exchange. The **Depository Trust Company (DTC)**, a

subsidiary of NSCC, transfers the securities from the account of the seller's broker to the account of buyer's broker at the end of the two-day settlement period. Individual client-level ownership records are maintained by the brokers. Market makers, due to their special significance, and due to the time required by the creation/redemption process, are afforded up to six days to settle their trades.

European markets are fragmented across many exchanges and countries, and ETF investors there tend to be mostly institutional investors. A majority of ETF trades occur in the over-the-counter (OTC) markets, without "live" bid and offer prices. Most European ETFs are listed on multiple exchanges and may have multiple classes. With 29 central depositories in Europe, the added complexity in settlement may widen the quoted bid-ask spreads.

LOS 35.c: Describe sources of tracking error for ETFs.

Tracking difference is the divergence between an ETF's return (based on its NAV) and the return on the tracked index. This measure provides an indication of the ETF's ability to follow its underlying benchmark. **Tracking error** is the annualized standard deviation of the daily tracking difference. Calculated as a standard deviation, tracking error does not indicate whether the ETF under- or outperformed the index, nor does it reveal the distribution of relative differences in return (i.e., whether the tracking difference occurred over time or was concentrated in a specific period).

As opposed to daily tracking difference, rolling holding periods allow us to evaluate the cumulative effect of portfolio management and expenses over a longer time period. Annual rolling holding period can be compared to an ETF's expense ratio; ETFs generally underperform the benchmark by their expense ratio.

Sources of tracking error include the following:

1. **Fees and expense.** Fees reduce a fund's return.
2. **Sampling and optimization.** ETFs may use statistical techniques to replicate the performance of a benchmark without investing in all the securities that the index covers. Optimization techniques often favor higher-liquidity securities (and larger market cap companies) to minimize transaction cost. As a result, the ETF may impart a size bias relative to the benchmark.
3. **Depository receipts (DRs).** Foreign index ETFs often invest in DRs (rather than less-liquid securities traded on local exchanges). Any difference between the price of DRs and corresponding security (e.g., due to time zone differences in capturing price data) may contribute to tracking error of the ETF. Furthermore, sometimes an ETF may invest in other (sector) ETFs, and thus inherit the tracking errors of those ETFs.
4. **Index changes.** Index providers will occasionally rebalance or reorganize their indexes. ETF managers often use the creation/redemption process to rebalance the ETF portfolio to reflect this change in the index. The resulting delays from the use of the creation/redemption process contributes to tracking error. Because changes to an index are relatively infrequent, this component is often the smallest contributor to total tracking error.

5. **Regulatory and tax requirements.** In some countries, tax rates for foreign investors and domestic investors differ, leading to a difference in after-tax returns between an ETF and the index that it tracks.
6. **Fund accounting practices.** The time of the day when ETF NAV is calculated versus when the index provider performs this computation can lead to differences in calculated returns. Additionally, ETFs with foreign-currency-denominated holdings may use exchange rate values captured at a different time than the rate used by the index provider.
7. **Asset manager operations.** ETF managers may try to lower their cost by lending their shares to short sellers, and by foreign dividend capture (i.e., by working with foreign governments to minimize the taxes on distributions received). These methods tend to improve ETF performance relative to their benchmark.



MODULE QUIZ 35.1

1. Z&E ETF is currently trading at \$23.45 per share. Its NAV is \$23.00. Beta Bank, an authorized participant in the ETF, would *most likely*:
 - A. do nothing.
 - B. redeem shares if the arbitrage gap is more than \$0.45.
 - C. create shares if the arbitrage gap is less than \$0.45.
2. The arbitrage gap on an ETF is *most likely* to be negatively related to the:
 - A. liquidity of the securities underlying the index that the ETF is trading.
 - B. service fees that the AP has to pay to the ETF manager for creation/redemption.
 - C. timing difference between when the ETF trades and when the securities underlying the tracked index trade.
3. The authorized participants (APs) in an ETF are *most likely* to be required to settle their ETF trades in:
 - A. one day.
 - B. two days.
 - C. six days.
4. Tracking error for an exchange-traded fund is *most accurately* described as the:
 - A. difference between the ETF's return and the return on the underlying index.
 - B. annualized difference between the ETF's returns and the return on underlying index adjusted for ETF expenses.
 - C. annualized standard deviation of the difference between daily returns on the ETF and the daily returns of its underlying index.
5. Which of the following is *least likely* to be a source of tracking error?
 - A. Fund accounting practices.
 - B. Creation/redemption processes.
 - C. Asset manager operations.

MODULE 35.2: SPREADS, PRICING RELATIVE TO NAV, AND COSTS



Video covering
this content is
available online.

LOS 35.d: Describe factors affecting ETF bid-ask spreads.

The primary factors affecting ETF **bid-ask spreads** are the liquidity and the market structure of the underlying securities.

- Spreads on fixed-income ETFs tend to be larger than those for large-cap equity ETFs.
- When ETFs and underlying securities trade in different markets and time zones, the spreads are narrower during the overlapping time period when both markets are open.
- Specialized ETFs, such as those that track commodities, volatility futures, or small-cap stocks, tend to have wider spreads.
- Thinly-traded ETFs, regardless of the liquidity of the underlying, also command a higher spread.

A market maker can offset an ETF transaction either with another counterparty in the secondary market or via the creation/redemption process in the primary market. Quoted spreads depend on whether the dealer is reasonably assured of completing an offsetting trade in the near future in the secondary market. APs can also undertake redemption/creation transactions in the primary market.

maximum spread =

creation/redemption fees plus other trading costs

+ spread of the underlying securities

+ risk premium for carrying the trade until close of trading

+ AP's normal profit margin

– discount based on probability of offsetting the trade in secondary market

Note that the posted bid-ask prices are for smaller order sizes, while larger trades are best handled via negotiation. For larger trades, the negotiated spreads vary based on liquidity conditions and volatility in the market. Spreads widen during volatile times or when significant new information is expected to be released to the market.

LOS 35.e: Describe sources of ETF premiums and discounts to NAV.

The NAV of an ETF is generally its fair value. If the ETF and the underlying securities trade on the same exchange, all closing prices are contemporaneously determined and any timing-related noise in pricing is eliminated. Exchanges publish intraday **indicated NAVs (iNAV)**, which are the fair value estimates during the trading day.

An ETF trading at a price above (below) NAV is said to be trading at a premium (discount). The premium or discount is calculated as a proportion of the NAV.

Using closing prices:

$$\text{ETF premium (discount) \%} = (\text{ETF price} - \text{NAV per share}) / \text{NAV per share}$$

Sources of premiums or discounts include the following:

- **Timing differences.** ETFs on foreign securities may experience gaps between the time the ETF is traded and the time when the underlying trades in a foreign market. These timing differences can cause a discrepancy between the NAV and the ETF's trading price. NAV may be based on the market's estimate of what those foreign securities would trade at if their local market was still open.

Similarly, OTC bonds that do not trade on an exchange will not have a true closing price; hence, the price of an ETF that comprises such bonds may not be equal to estimated NAV. Fair value estimates of nontraded bonds are often determined by pricing services that may base fair value estimates on bid prices of comparable bonds. If these bid prices are low due to higher dealer risk of carrying those bonds in inventory, the closing ETF price would be higher than the NAV based on these fair value estimates.

- **Stale pricing.** Infrequently traded ETFs may reflect noncurrent prices and, therefore, their value may differ from NAV. Suppose the last ETF trade occurred at 2:00 pm ET and the markets (for the ETF and the underlying) closed at 4:00 pm ET. The NAV calculated based on the closing prices of the underlying may differ from the stale price (i.e., the 2:00 pm price) of the ETF.

ETF prices may be more informative than NAV or iNAV when (1) the market for the underlying is closed, (2) underlying securities are highly volatile or illiquid, or (3) there is a time lag between the pricing of the ETF and the pricing of underlying.

LOS 35.f: Describe costs of owning an ETF.

ETF costs include management fees and trading costs. Because the market for ETF providers is highly competitive, and because ETFs are passively managed, management fees for ETFs tend to be lower than those for mutual funds.

Trading costs include brokerage or commission fees and bid-ask spreads. Additionally, larger orders may incur price-impact costs depending on the liquidity of the secondary market. The premium/discount relative to NAV can be another hidden part of the trading cost (that is realized if the said premium/discount reverses over the holding period).

The portfolio turnover of ETFs results in an implicit cost which acts as a drag on returns for the investor. ETFs that track stable indices will have lower portfolio turnover cost; this cost is negligible for most ETFs.

Because trading costs are only incurred at the time of the transaction, annualized trading cost diminishes over a longer holding period. For investors that trade frequently, the spread and commission (part of trading cost) are far more important components of the total cost. For long-term, buy-and-hold investors, management fees are a more important component of the cost:

total cost = round-trip trading cost + management fees

round-trip trading cost = round-trip commission + spread

EXAMPLE: Cost of investing in ETFs

Z&E ETF is quoted at a bid-ask spread of 0.15%. ETF commissions are 0.10% of the trade value. Management fees are 0.08% per year.

Calculate the cost of holding the ETF for 3 months, for 1 year, and for 5 years. For the 5-year holding period, also calculate the average annual total cost.

Answer:

Round-trip commission = $2 \times 0.10\% = 0.20\%$

Round-trip trading cost = round-trip commission + spread = $0.20\% + 0.15\% = 0.35\%$

Holding cost for 3 months = round-trip trading cost + management fees = $0.35\% + (3/12) \times 0.08\% = 0.37\%$

Holding cost for 1 year = $0.35\% + 0.08\% = 0.43\%$

Holding cost for 5 years = $0.35\% + (5 \times 0.08\%) = 0.75\%$.

Average annual cost (for 5-year holding period) = $0.75\% / 5 = 0.15\%$

As can be seen in this example, for shorter holding periods, trading cost dominates the cost of ETF ownership. Short-term tactical traders may prefer to trade in high-liquidity, lower trading cost ETFs even if they have higher management fees. Conversely, long-term investors are likely to seek out ETFs with low management fees.



MODULE QUIZ 35.2

1. The maximum quoted spread on an ETF is *most likely* to be negatively related to the:
A. AP's profit margin.
B. quoted spreads of securities underlying the tracked index.
C. probability of completing an offsetting trade in the secondary market.
2. If an ETF is trading at a price above its iNAV, it is *most likely*:
A. overvalued.
B. trading at a premium.
C. trading at a discount.
3. Of the various components of ETF cost, a long-term buy-and-hold investor is *most likely* to focus on:
A. management fees.
B. trading costs.
C. creation/redemption service fees.

MODULE 35.3: ETF RISKS AND PORTFOLIO APPLICATIONS



Video covering this content is available online.

LOS 35.g: Describe types of ETF risk.

Risks of investing in an ETF include the following:

- **Counterparty risk.** Some ETF legal structures expose the investors to counterparty risk. **Exchange-traded notes (ETNs)**, for example, have high counterparty risk. In the case of an ETN, an issuer (typically a bank) issues unsecured debt obligations that promise to pay the return on an index less management fees (just like a regular ETF). Consider, for example, a large bank that wants to issue unsecured debt at a fixed interest rate. If the fixed interest rate that the market demands is significantly higher than the swap fixed rate for same maturity, the bank may instead issue an ETN that pays the return on an equity index. The bank then would simultaneously enter into an equity swap as the

equity return receiver and the (swap) fixed rate payer. The index return received is used to service the ETF, and the bank's effective borrowing cost becomes the swap fixed rate (we will assume that the ETN management fees cover the actual cost of the structure).

The concern here is that the bank may default, resulting in losses for the ETN investor (e.g., Lehman Brothers defaulted on three ETNs in 2008). Investors can estimate the counterparty credit risk by the credit default spreads (CDS spread) of the issuing bank: large CDS spreads indicate high counterparty risk. In general, a one-year CDS spread above 5% is considered to be very risky.

- **Settlement risk.** ETFs using OTC derivative contracts as part of their strategy expose investors to the settlement risk of such contracts. ETFs mitigate settlement risk by frequent (e.g., daily or weekly) settlement, and/or by requiring collateral to be posted.
- **Security lending.** Like mutual funds, ETFs may lend their securities to short sellers for a fee. These lending agreements are overcollateralized, and the collateral is invested in short-term risk-free securities. Lending fees are often lucrative and are usually passed on to the ETF investors, offsetting the fund's operating expenses. The (rather insignificant) risk of the security borrower defaulting is, however, borne by the ETF investors.
- **Fund closures.** Similar to mutual fund closures, ETF closures involve selling the underlying holdings and making cash distributions to the investors, potentially with adverse tax consequences for them. *Soft closures* entail creation halts and changes in investment strategy. Closures may be triggered by changes in regulation, competitive pressures, or issuer merger. Increased competition may force ETFs that fail to attract sufficient capital to close prematurely.

In addition to fund closures, investors may also be exposed to the risk of creation/redemption halts. Particular to ETNs, this risk arises when the issuer is no longer interested in additional borrowings. When creations are halted, ETNs may trade at a significant premium to their NAV as the arbitrage mechanism breaks down.

Another reason for fund closure is that the issuer may want to change investment strategy. This results in closing down of the fund tracking the original strategy and opening of a new fund tracking a different strategy. This is rather uncommon, as, more typically, issuers make minor changes in investment strategy, requiring small adjustments to portfolio composition rather than fund closure.

- **Expectation-related risk.** ETFs based on complex strategies (e.g., inverse or leveraged ETFs) may introduce the investor to risks that they may not fully comprehend (i.e., the outcomes may differ from investors' expectations). These complex ETFs might use derivative products to implement their investment strategy that must reset daily (i.e., have daily settlement).

For example, an ETF with NAV of \$100 delivering two times the S&P 500 return would enter into a swap with a notional twice the NAV of the ETF (reset daily). Suppose that the daily return is +5% on the first day, and -5% on the next day. The NAV would grow to $100 + (2 \times 5\%) = \$110$ on the first day. On the second day, the NAV would decline by 10% or $110 \times (1 - 0.10) = \99 . A less-sophisticated investor might expect the NAV to finish unchanged by these offsetting returns.

The compounding effects of leveraged ETFs make them unsuitable for buy-and-hold investors with investment horizons exceeding one month.

LOS 35.h: Identify and describe portfolio uses of ETFs.

Due to their low costs, tax efficiency, and wide variety, ETFs are suitable for numerous portfolio strategies. Some of them are described in the following.

1. Efficient portfolio management, including the following:

- a. *Portfolio liquidity management*: Managers can quickly equitize excess cash by investing it in ETFs, in order to reduce cash drag on the portfolio. Because of their superior liquidity, ETFs have a lower transaction cost as compared to other securities; portfolio allocations to ETFs can be used to cover future cash outflows.
- b. *Portfolio rebalancing*: ETFs can be used to cost-effectively rebalance portfolios to target specific asset class weights. ETFs can also be shorted to quickly reduce the weight of a specific sector or asset class.
- c. *Portfolio completion*: ETFs can be used to fill temporary gaps in portfolio allocation. Gaps can arise due to manager turnover (when the new manager has different macro views) or when the existing manager's allocation differs from the investor's desired exposure. Suppose for example that a manager moves out of small-caps; an investor seeking continued exposure to small-caps can invest a portion of her portfolio in a small-cap ETF. Similarly, investors in an actively managed fund could use ETFs to adjust overall exposure to suit their individual preferences.
- d. *Transition management*: A new manager might temporarily invest in ETFs as she winds down the portfolio allocations of the old manager, so as to maintain market exposure during the transition period.

It should be noted that ETFs may not be suitable for very large asset owners: separately managed accounts (SMAs) may be able to operate at a cost even lower than the ETF fees. Furthermore, SMAs can be customized (as opposed to the rigid allocations of ETFs). Finally, regulators often require public disclosure of large ETF holdings, which SMAs may not want to do.

2. Asset class exposure management. The wide variety of ETFs, including asset class, subclass, and sector, allow a manager to implement a variety of strategies suitable for their clients. Often, ETFs provide significant cost advantages relative to investing in the underlying securities. For example, it is easier to trade fixed-income ETFs versus the underlying bonds (which tend to be relatively illiquid). Strategies include the following:

- a. *Core exposure to an asset class or sub-asset class*: Portfolio allocations to passive indices of various asset classes/subclasses can be cost-effectively implemented using ETFs. Portfolios can be broadly diversified by investing in different sectors of equity asset class, commodities, bonds, etc. Targeted strategic allocation to a specific subsector can also be implemented for an investor based on suitability (e.g., an investor seeking exposure to precious metals).

b. *Tactical strategies*: Managers can temporarily rotate money into/out of sectors expected to perform better/worse using ETFs. Thematic ETFs can also be used to select subsectors (e.g., ecommerce versus the broad technology sector) that are expected to outperform. ETFs selected for short-term tactical strategies are selected based on lower trading cost and liquidity rather than low management fees. (Liquidity is evaluated using the ratio of average dollar volume to average assets—higher is better).

3. **Active investing.** While ETFs have historically been used for passive allocation to asset classes, newer varieties of ETFs with an active component have gained traction, especially for fixed income. These ETFs are constructed based on predefined rules rather than manager discretion. Smart beta ETFs, for example, may use quantitative screens or use weights based on company fundamentals (e.g., dividend yield).

a. *Factor (smart beta) ETFs*: Benchmarked to an index that is created with predefined rules (e.g., with screens and weightings). The ETF strategy is based on return drivers (i.e., factors such as size and momentum). Within a single factor, competing ETF managers' offerings may differ based on the factor chosen or the weights assigned to portfolio holdings (e.g., equal weighted versus cap-weighted). Long-term buy-and-hold investors seeking a desired factor exposure may choose to invest in these ETFs in the expectation of outperformance of those factors. Multifactor ETFs provide exposure to several factors and can dynamically change portfolio weights based on market opportunities. Performance of these ETFs depends on whether the ETF (via its rules) was successful in gaining exposure to that factor, and whether the chosen exposure was rewarded by the market.

b. *Risk management*: Some ETFs are constructed to provide higher or lower risk relative to a passive index. Low volatility ETFs, for example, use rules to construct portfolios with low relative return volatility. Some ETFs may be constructed to hedge specific risks; currency-hedged global equity ETFs provide international equity exposure but without the added currency risk. Similarly, duration-risk-hedged high-yield corporate bond ETFs only provide exposure to credit risk while hedging the interest rate risk.

c. *Alternatively weighted ETFs*: Constructed using portfolio weights that differ from standard market cap weights (e.g., equally weighted, weightings based on fundamentals).

d. *Discretionary active ETFs*: Actively managed and are similar to closed-end mutual funds. The largest of these are fixed-income ETFs, which include exposures to senior bank loans, mortgage securities, and floating rate notes.

e. *Dynamic asset allocation and multi-asset strategies*: Dynamic top-down asset allocation ETFs that invest in stocks and bonds based on risk/return forecasts. These are popular among global asset managers and hedge funds for their discretionary asset allocation.

With a wide variety of "alternative" ETFs available, investors should perform due diligence regarding index construction methodology and performance history to determine suitability.



1. Exchange-traded notes are *most likely* to be described as having a high:
 - A. settlement risk.
 - B. counterparty risk.
 - C. fund closure risk.
2. Inverse leveraged ETFs are *most likely* to be described as having a high:
 - A. expectation-related risk.
 - B. counterparty risk.
 - C. fund closure risk.
3. Smart beta strategies are *most likely* to be used by investors seeking to:
 - A. outperform the benchmark.
 - B. match the benchmark risk.
 - C. trade for tactical purposes.
4. Active ETF strategies are *most likely* to be used:
 - A. for fixed income rather than for equity.
 - B. for tactical trading.
 - C. to reduce the tracking risk.

KEY CONCEPTS

LOS 35.a

Authorized participants (APs) can create additional shares by delivering the creation basket to the ETF manager. Redemption is similarly conducted by tendering ETF shares and receiving a redemption basket. These primary market transactions are in kind and require a service fee payable to the ETF issuer, shielding the nontransacting shareholders from the costs and tax consequences of creation/redemption. The creation/redemption process ensures that market prices of ETFs stay within a narrow band of the NAV.

LOS 35.b

ETFs are traded just like other shares on the secondary markets. Market fragmentation may widen the quoted spreads for European ETFs.

LOS 35.c

Tracking error is the annualized standard deviation of the daily tracking difference. Sources of tracking error include fees and expenses of the fund, sampling, and optimization used by the fund, the fund's investment in depository receipts (DRs) (as opposed to the underlying shares directly), changes in the index, regulatory and tax requirements, fund accounting practices, and asset manager operations.

LOS 35.d

ETF spreads are positively related to the cost of creation/redemption, the spread on the underlying securities, the risk premium for carrying trades until close of trade, and the APs' normal profit margin. ETF spreads are negatively related to the probability of completing an offsetting trade on the secondary market. Creation/redemption fees and other trading costs can influence spreads as well.

LOS 35.e

$$\text{ETF premium (discount) \%} = (\text{ETF price} - \text{NAV}) / \text{NAV}$$

Sources of premium or discount include timing difference for ETFs with foreign securities traded in different time zones and stale pricing for infrequently traded ETFs.

LOS 35.f

ETF costs include trading cost and management fees. Short-term investors focus on lower trading costs while longer-term, buy-and-hold investors seek lower management fees. Trading costs tend to be lower for more-liquid ETFs. Liquidity is evaluated using the ratio of average dollar volume to average assets (higher is better).

LOS 35.g

Risks of investing in ETFs include counterparty risk (common for ETNs), fund closures, and expectation-related risk.

LOS 35.h

Portfolio uses of ETFs include the following:

1. Efficient portfolio management, including liquidity management, portfolio rebalancing, portfolio completion, and transition management.
2. Asset class exposure management, including core exposure to an asset class or sub-asset class as well as tactical strategies.
3. Active investing, including smart beta, risk management, alternatively weighted ETFs, discretionary active ETFs, and dynamic asset allocation.

ANSWER KEY FOR MODULE QUIZZES

Module Quiz 35.1

1. **C** The AP would earn a profit by selling the shares in the market at \$23.45 while creating shares at \$23.00 plus costs. These costs (or arbitrage gap) would have to be less than \$0.45 per share for the AP to make a profit. (LOS 35.a)
2. **A** The arbitrage gap varies with transaction costs, service fees payable to the ETF manager, and the timing difference between when the ETF trades and when the underlying securities trade (due to time zone differences for foreign securities). Illiquid securities will generally have higher transaction costs and hence higher arbitrage gaps, while liquid securities will have a lower arbitrage gap. (LOS 35.a)
3. **C** APs are typically given 6 days to complete settlement, reflecting the amount of time needed for creation/redemption. (LOS 35.b)
4. **C** Tracking error is the annualized standard deviation of the daily tracking difference, which is the difference between daily returns on an ETF and daily returns of the underlying index. (LOS 35.c)
5. **B** The creation/redemption process may actually mitigate tracking error when the index changes. The other two are sources of tracking error. (LOS 35.c)

Module Quiz 35.2

1. **C** A higher probability of completing an offsetting trade results in a reduction (i.e., discount) in the quoted spreads. The other two components are *positively* related to the quoted spread. (LOS 35.d)
2. **B** ETFs trading at a price above their iNAV are said to be trading at a premium. The ETF need not be overvalued; the premium may be the result of timing differences. (LOS 35.e)
3. **A** While all costs are important, long-term investors should be more concerned with recurring annual management fees as opposed to one-time trading costs. Creation/redemption fees are paid by the AP to the ETF manager and are reflected in the quoted spread (which is part of trading costs). (LOS 35.f)

Module Quiz 35.3

1. **B** While ETNs are exposed to counterparty, fund closure, and settlement risks, the most severe is counterparty risk whereby the ETN issuer may default. (LOS 35.g)
2. **A** Inverse and leveraged ETFs may not be well understood by their investors, leading to a gap between expectation and actual outcome; this is expectation-related risk. (LOS 35.g)
3. **A** Smart beta strategies are active ETF strategies that seek to outperform the benchmark. Long-term buy-and-hold investors seeking a desired factor exposure may choose to invest in these ETFs in the expectation of outperformance of that factor. (LOS 35.h)
4. **A** Due to the low liquidity of most fixed-income securities, active fixed-income ETFs are more popular than active equity ETFs. Generally, active ETFs are suitable for long-term buy-and-hold investors. Because active strategies seek to beat the benchmark, tracking risk is expected to be higher than for passive ETFs. (LOS 35.h)

READING 36

USING MULTIFACTOR MODELS

EXAM FOCUS

Factor models are important in understanding risk exposures and in asset selection. Be able to construct arbitrage portfolios and be familiar with different multifactor models (and their differences), how they can be used, and their advantages over CAPM. Also understand the application of multifactor models to return and risk decomposition and the use of multifactor models in portfolio construction, including the use of factor portfolios in making bets on a specific risk factor.

MODULE 36.1: MULTIFACTOR MODELS



Video covering this content is available online.

LOS 36.a: Describe arbitrage pricing theory (APT), including its underlying assumptions and its relation to multifactor models.

Arbitrage pricing theory (APT) was developed as an alternative to the capital asset pricing model. It is a linear model with multiple systematic risk factors priced by the market. However, unlike CAPM, APT does not identify the specific risk factors (or even the number of factors).

Assumptions of Arbitrage Pricing Theory (APT)

1. *Unsystematic risk can be diversified away in a portfolio.* Investors have the choice of a large number of assets such that unsystematic risk can be diversified by forming portfolios of assets. This is a reasonable assumption and is supported by empirical evidence.
2. *Returns are generated using a factor model.* Unfortunately, the APT provides little practical guidance for the identification of the risk factors. The lack of clarity for the risk factors is a major weakness of the APT.
3. *No arbitrage opportunities exist.* An arbitrage opportunity is defined as an investment opportunity that bears no risk and no cost, but provides a profit. This assumption implies that investors will undertake infinitely large positions (long and short) to exploit any perceived mispricing, causing asset prices to adjust immediately to their equilibrium values.

The asset pricing model developed by the arbitrage pricing theory is called the *arbitrage pricing model*.

The APT Equation

The APT describes the equilibrium relationship between expected returns for well-diversified portfolios and their multiple sources of systematic risk.

$$E(R_P) = R_F + \beta_{P,1}(\lambda_1) + \beta_{P,2}(\lambda_2) + \dots + \beta_{P,k}(\lambda_k)$$

Each λ stands for the expected risk premium associated with each risk factor. λ_j equals the risk premium for a portfolio (called a *pure factor portfolio*) with factor sensitivity equal to 1 to factor j and factor sensitivities of zero for the remaining factors. Remember that a risk premium is the difference between the expected return and the risk-free rate (R_F). It is the extra expected return from taking on more risk.

Each β represents the factor sensitivity of Portfolio P to that risk factor. Each factor in the arbitrage pricing model is "priced," meaning that each risk premium is statistically and economically significant. Unlike the CAPM, the APT does *not* require that one of the risk factors is the market portfolio. This is a major advantage of the arbitrage pricing model.



PROFESSOR'S NOTE

The CAPM can be considered a special restrictive case of the APT in which there is only one risk factor, and where that one factor is restricted to be the market risk factor.

LOS 36.b: Define arbitrage opportunity and determine whether an arbitrage opportunity exists.

The method for exploiting arbitrage opportunities in the APT framework is detailed in the following example.

EXAMPLE: Exploiting an arbitrage opportunity

Suppose your investment firm uses a single-factor model to evaluate assets. Consider the following data for Portfolios A, B, and C:

Portfolio	Expected Return	Factor Sensitivity (beta)
A	10%	1.0
B	20%	2.0
C	13%	1.5

Calculate the arbitrage opportunity from the data provided.

Answer:

By allocating 50% of our funds to Portfolio A and 50% to Portfolio B, we can obtain a Portfolio (D) with beta equal to the Portfolio C beta (1.5):

$$\text{Beta for Portfolio D} = 0.5(1) + 0.5(2) = 1.5$$

While the betas for Portfolios D and C are identical, the expected returns are different:

$$\text{Expected return for Portfolio D} = 0.5(0.10) + 0.5(0.20) = 0.15 = 15\%$$

Therefore, we have created Portfolio D that has the same risk as Portfolio C (beta = 1.5) but has a higher expected return than Portfolio C (15% versus 13%). By purchasing Portfolio D and short-selling Portfolio C, we expect to earn a 2% return (15% minus 13%).



PROFESSOR'S NOTE

Recall that a portfolio beta equals the weighted average of the individual asset betas, and, likewise, the portfolio expected return equals the weighted average of the individual asset expected returns.

The portfolio that is long Portfolio D and short Portfolio C is called the arbitrage portfolio. We have invested nothing upfront because we can use the proceeds of the short sale on Portfolio C to purchase Portfolio D, and we have undertaken no net systematic risk. The overall beta of our investment equals the difference in betas between our long and short positions: $1.5 - 1.5 = 0$. As investors exploit the arbitrage opportunity, prices of assets in Portfolio C will drop and the (future) expected return for Portfolio C will rise to its equilibrium value.



PROFESSOR'S NOTE

Generally, we want to go *long* assets that have a *high* ratio of return-per-unit-of-factor-exposure, and *short* assets that have a *low* return-to-factor-exposure ratio.

The APT assumes there are no market imperfections preventing investors from exploiting arbitrage opportunities. As a result, extreme long and short positions are permitted and mispricing will disappear immediately. Therefore, all arbitrage opportunities such as the one described in the previous example would be exploited and eliminated immediately.

LOS 36.c: Calculate the expected return on an asset given an asset's factor sensitivities and the factor risk premiums.

Given a portfolio's factor exposures (betas) and factor risk premiums, we can easily compute the portfolio's expected return as shown in the following example.

EXAMPLE: Calculating expected returns from the arbitrage pricing model

An investment firm employs a two-factor APT model. The risk-free rate equals 5%. Determine the expected return for the Invest Fund using the following data:

	Factor 1	Factor 2
Invest Fund factor betas	1.50	2.00
Factor risk premiums	0.0300	0.0125

Answer:

Using the two-factor APT model, the expected return for the Invest Fund (IF) equals:

$$E(R_{IF}) = 0.05 + 1.5(0.03) + 2(0.0125) = 0.12 = 12\%$$

We can also use factor models to compute the parameter values given expected returns and factor exposures.

EXAMPLE: Calculating APT parameters given expected returns

1. Given a one-factor model and the following information, calculate the risk-free rate and the factor risk premium.

Portfolio	Expected Return	Factor Sensitivity
A	7.0%	1.0
B	7.8%	1.2

2. Verify that Portfolio C with an expected return of 6.2% and factor sensitivity of 0.8 is priced correctly.

Answer:

1. Expected return = risk-free rate + factor sensitivity \times risk premium

Therefore, given the information for portfolios A and B:

$$0.07 = R_f + 1.0 \times \lambda; R_f = 0.07 - \lambda$$

Substituting this information for Portfolio B:

$$0.078 = (0.07 - \lambda) + 1.2\lambda; \lambda = 0.04 \text{ or } 4\%$$

$$R_f = 0.07 - \lambda = 0.07 - 0.04 = 0.03 \text{ or } 3\%$$

2. Expected return for Portfolio C = $0.03 + (0.8 \times 0.04) = 6.2\%$. Hence, Portfolio C is correctly priced.



MODULE QUIZ 36.1

1. Which of the following *least accurately* identifies an assumption made by the APT?
 - A. Asset returns are described by a factor model.
 - B. Unsystematic risk can be diversified away.
 - C. Arbitrage will force risk premiums on systematic risk to be zero.
2. Eileen Bates, CFA has collected information on the following three portfolios:

Portfolio	Expected Return	Factor Sensitivity
A	10%	1.20
B	20%	2.00
C	13%	1.76

An arbitrage strategy would *most likely* involve a short position in which portfolio?

- A. Portfolio A.
 - B. Portfolio B.
 - C. Portfolio C.
3. Catalyst Fund uses a two-factor model to analyze asset returns.

	Factor 1	Factor 2
Stock A factor sensitivities	0.88	1.10
Factor risk premiums	0.03	0.01

Given that the risk-free rate equals 5%, the expected return for the stock A is *closest to*:

- A. 4.2%.
- B. 8.7%.
- C. 9.2%.

MODULE 36.2: MACROECONOMIC FACTOR MODELS, FUNDAMENTAL FACTOR MODELS, AND STATISTICAL FACTOR MODELS



Video covering this content is available online.

LOS 36.d: Describe and compare macroeconomic factor models, fundamental factor models, and statistical factor models.

The CAPM could be described as a single-factor model because it assumes asset returns are explained by a single factor: the return on the market portfolio. A *multifactor model* assumes asset returns are driven by more than one factor. There are three general classifications of multifactor models: (1) **macroeconomic factor models**, (2) **fundamental factor models**, and (3) **statistical factor models**:

1. *Macroeconomic factor models* assume that asset returns are explained by surprises (or “shocks”) in macroeconomic risk factors (e.g., GDP, interest rates, and inflation). Factor surprises are defined as the difference between the realized value of the factor and its consensus predicted value.



PROFESSOR'S NOTE

The key to macroeconomic factor models is that the variables that explain returns reflect not the value of the macroeconomic variable itself, but rather the unexpected part (i.e., the surprise), because we assume that the expected value has already been reflected in stock prices. For example, if the government announces that GDP grew at an annual rate of 1.5% and the consensus prediction was 2.5%, the surprise was negative 1%. The 2.5% consensus forecast was already reflected in market prices, so the negative surprise, which was bad news to the market, should cause stock prices to fall (i.e., the expected return will be negative).

2. *Fundamental factor models* assume asset returns are explained by multiple firm-specific factors (e.g., P/E ratio, market cap, leverage ratio, and earnings growth rate).
3. *Statistical factor models* use statistical methods to explain asset returns. Two primary types of statistical factor models are used: factor analysis and principal component models. In factor analysis, factors are portfolios that explain covariance in asset returns. In principal component models, factors are portfolios that explain the variance in asset returns. The major weakness is that the statistical factors do not lend themselves well to economic interpretation. Therefore, *statistical* factors are *mystery* factors.

Because of the popularity of macroeconomic factor and fundamental factor models, we will provide a more expanded discussion of these models.

MACROECONOMIC FACTOR MODELS

The following model is an example of a two-factor macroeconomic model in which stock returns are explained by surprises in GDP growth rates and credit quality spreads:

$$R_i = E(R_i) + b_{i1}F_{GDP} + b_{i2}F_{QS} + \varepsilon_i$$

where:

R_i = return for Asset i

$E(R_i)$ = expected return for Asset i (in the absence of any surprises)

F_{GDP} = surprise in the GDP rate

F_{QS} = surprise in the credit quality spread
(BB-rated bond yield – Treasury bond yield)

b_{i1} = GDP surprise sensitivity of Asset i

b_{i2} = credit quality spread surprise sensitivity of Asset i

ε_i = firm-specific surprise (unrelated to the two macro factors)

Let's take a closer look at each of the components:

- Each "F" is a factor surprise, the difference between the predicted value of the factor and the realized value.
- Each "b" is the sensitivity of the stock to that surprise. The higher the sensitivity, the larger the change in return for a given factor surprise.
- The firm-specific surprise captures the part of the return that can't be explained by the model. It represents unsystematic risk related to firm-specific events like a strike or a warehouse fire.

EXAMPLE: Compute a stock return using a macroeconomic factor model

The following two-factor model is used to explain the returns for Media Tech (MT):

$$R_{MT} = E(R_{MT}) + b_{MT,1}F_{GDP} + b_{MT,2}F_{QS} + \varepsilon_{MT}$$

The expected return for Media Tech equals 10%. Over the past year, GDP grew at a rate that was 2 percentage points higher than originally expected, and the quality spread was 1 percentage point lower than originally expected. Media Tech's sensitivity to the GDP rate factor equaled 2, and its sensitivity to the quality spread factor equaled -0.5. Over the past year, Media Tech also experienced a 2% company-unique surprise return (i.e., unrelated to the two macro factors). Construct the macroeconomic factor model for Media Tech, and calculate its return for the year.

Answer:

The two-factor model for Media Tech is:

$$\begin{aligned} R_{MT} &= 0.10 + 2(0.02) - 0.50(-0.01) + 0.02 = \\ &0.100 \text{ (the expected return)} \\ &+ 0.040 \text{ (the return from the positive GDP surprise)} \\ &+ 0.005 \text{ (the return from the positive quality spread surprise)} \\ &+ 0.020 \text{ (the return from unexpected firm specific events)} \\ &= 0.165, \text{ or } 16.5\% \end{aligned}$$

The Media Tech return was higher than originally expected because MT was positively affected by higher-than-expected economic growth (GDP), lower-than-expected credit quality risk spreads (QS), and positive company-specific surprise events.



PROFESSOR'S NOTE

Be careful to interpret the signs properly. A decrease in the quality spread (a surprise less than zero) is good news for MT stock because it has a negative sensitivity to the factor. When credit quality spreads increase, MT's return goes down, and when credit quality spreads decrease, MT's return goes up.

The main features of the macroeconomic factor model include the systematic or priced risk factors and the factor sensitivities.

Priced Risk Factors

A risk that does not affect many assets (i.e., an *unsystematic risk*) can usually be diversified away in a portfolio and will not be priced by the market. "Not priced" means investors cannot expect to be rewarded for being exposed to that type of risk.

The factors in our example model, GDP and credit quality spread shocks, are *systematic* risk factors, meaning that they will affect even well-diversified portfolios. Since they cannot be avoided, systematic factors represent priced risk (i.e., risk for which investors can expect compensation).

Factor Sensitivities

In a macroeconomic multifactor model, asset returns are a function of unexpected surprises to systematic factors, and different assets have different *factor sensitivities*. For example, retail stocks are very sensitive to GDP growth and, hence, have a large sensitivity to the GDP factor. Small, unexpected changes in GDP growth cause large changes in retail stock prices because changes in income affect retail spending. Other stocks are less sensitive to GDP and have smaller GDP factor sensitivities. Retail grocer stocks, for example, do not react as much to changes in GDP because spending on food items is less sensitive to changes in national income. The factor sensitivities of the model can be estimated by regressing historical asset returns on the corresponding historical macroeconomic factors.

FUNDAMENTAL FACTOR MODELS

Consider the following fundamental factor model:

$$R_i = a_i + b_{i1}F_{P/E} + b_{i2}F_{SIZE} + \varepsilon_i$$

where:

R_i = return for stock i

$F_{P/E}$ = return associated with the P/E factor

F_{SIZE} = return associated with the SIZE (market capitalization) factor

a_i = intercept

b_{i1} = standardized sensitivity of stock i to the P/E factor

b_{i2} = standardized sensitivity of stock i to the SIZE factor

ε_i = portion of asset i return not explained by the factor model

Let's take a closer look at each of the components of a fundamental factor model.

Standardized sensitivities (b_{i1} and b_{i2}). Sensitivities in most fundamental factor models are not regression slopes. Instead, the fundamental factor sensitivities are standardized attributes (similar to z-statistics from the standard normal

distribution). For example, the standardized P/E sensitivity in a fundamental factor model is calculated as:

$$b_{i1} = \frac{(P/E)_i - \overline{P/E}}{\sigma_{P/E}}$$

where:

$(P/E)_i$ = P/E for stock i

$\overline{P/E}$ = average P/E calculated across all stocks

$\sigma_{P/E}$ = standard deviation of P/E ratios across all stocks

Also note that by standardizing the factor sensitivity, we measure the number of standard deviations that each sensitivity is from the average. For example, a stock with a standardized P/E sensitivity of 2.0 has a P/E that is 2 standard deviations above the mean; a stock with a sensitivity of -1.5 has a P/E that is one and a half standard deviations below the mean. This standardization process allows us to use fundamental factors measured in different units in the same factor model. For example, P/E ratios are usually greater than 1.00, while dividend yields are in percentages (i.e., less than 1.00). The one exception is factors for binary variables (e.g., industry classification).

EXAMPLE: Calculating a standardized sensitivity in a fundamental factor model

The P/E for stock i is 15.20, the average P/E for all stocks is 11.90, and the standard deviation of P/E ratios is 6.30. Calculate the standardized sensitivity of stock i to the P/E factor.

Answer:

The sensitivity of stock i to the P/E factor is:

$$\beta_{i, \frac{P}{E}} = \frac{15.20 - 11.90}{6.30} = 0.52$$

Therefore, the P/E ratio for the stock is 0.52 standard deviations higher than the average stock P/E.

Factor returns ($F_{P/E}$ and F_{SIZE}). The fundamental factors are rates of return associated with each factor (e.g., the difference in rate of return between low and high P/E stocks). The return difference between low and high P/E stocks is commonly referred to as the return on a factor mimicking portfolio. In practice, the values of the fundamental factors are estimated as slopes of cross-sectional regressions in which the dependent variable is the set of returns for all stocks and the independent variables are the standardized sensitivities.

Intercept term (a_i). In fundamental factor models, the factors are not return surprises. Hence, the expected factor values are not zero, and the intercept term is no longer interpreted as the expected return.

The Macroeconomic Factor Model vs. the Fundamental Factor Model

The key differences between the macroeconomic factor model and the fundamental factor model can be summarized as follows:

- *Sensitivities.* The standardized sensitivities in the fundamental factor model (b_{i1} and b_{i2}) are calculated directly from the attribute (e.g., P/E) data—they are not estimated. This contrasts with the macroeconomic factor model, in which the sensitivities are regression slope estimates.
- *Interpretation of factors.* The macroeconomic factors (F_{GDP} and F_{QS}) are surprises in the macroeconomic variables (e.g., inflation shock and interest rate shock). In contrast, the fundamental factors ($F_{P/E}$ and F_{SIZE}) are rates of return associated with each factor and are estimated using multiple regression.
- *Intercept term.* The intercept in the macroeconomic factor model equals the stock's expected return (based on market consensus expectations of the macro factors) from an equilibrium pricing model like the APT. In contrast, the intercept of a fundamental factor model with standardized sensitivities has no economic interpretation; it is simply the regression intercept necessary to make the unsystematic risk of the asset equal to zero.



MODULE QUIZ 36.2

1. Jones Brothers uses a two-factor macroeconomic factor model to evaluate stocks and has derived the following results for the stock of AmGrow (AG):

- Expected return: 10%
- GDP factor sensitivity: 2
- Inflation factor sensitivity: -0.5

Over the past year, GDP grew at a rate that was two percentage points lower than originally expected, and inflation rose two percentage points higher than originally expected. AG also experienced a large unexpected product recall causing a firm-unique surprise of -4% to its stock price. Based on the information provided, the rate of return for AG for the year was *closest* to:

- A. 1%.
- B. 2%.
- C. 3%.

MODULE 36.3: MULTIFACTOR MODEL RISK AND RETURN



Video covering this content is available online.

LOS 36.e: Describe uses of multifactor models and interpret the output of analyses based on multifactor models.

Multifactor models can be useful for return attribution, risk attribution, and portfolio construction.

Return Attribution

Multifactor models can be used to attribute a manager's active portfolio return to different factors.

Active return equals the differences in returns between a managed portfolio and its benchmark:

$$\text{Active return} = R_P - R_B$$

We can decompose active return into its two components: (1) factor return (arising from the manager's decision to take on factor exposures that differ from those of the benchmark) and (2) security selection (arising from the manager choosing a different weight for specific securities compared to the weight of those securities in the benchmark). These two differences also contribute to active risk (discussed later).

$$\text{Active return} = \text{factor return} + \text{security selection return}$$

where:

$$\text{factor return} = \sum_{i=1}^k (\beta_{pi} - \beta_{bi}) \times (\lambda_i)$$

where:

β_{pi} = factor sensitivity for the i th factor in the active portfolio

β_{bi} = factor sensitivity for the i th factor in the benchmark portfolio

λ_i = factor risk premium for factor i

The security selection return is then the *residual* difference between active return and factor return:

$$\text{security selection return} = \text{active return} - \text{factor return}$$

EXAMPLE: Return decomposition

Glendale Pure Alpha Fund generated a return of 11.2% over the past 12 months, while the benchmark portfolio returned 11.8%. Suppose we are provided a fundamental factor model with two factors as given in the following.

Factor	Factor Sensitivity (betas)		Factor Risk Premium (λ)
	Portfolio	Benchmark	
P/E	1.10	1.00	-5.00%
Size	0.69	1.02	2.00%

1. Attribute the cause of the difference in returns.
2. Describe the manager's apparent skill in factor bets as well as in security selection.

Answer:

Factor	Factor Sensitivity (betas)			Factor Risk Premium (λ)	Contribution to Active Return
	Portfolio	Benchmark	Difference		
	(1)	(2)	(3)	(4)	(5) = (3) \times (4)
P/E	1.10	1.00	0.10	-5.00%	-0.50%
Size	0.69	1.02	-0.33	2.00%	-0.66%
				Total	-1.16%

1. Difference between portfolio return and benchmark return = 11.20% - 11.80% = -0.60%

Return from factor tilts (computed previously) = -1.16%

Return from security selection = -0.60% - (-1.16%) = +0.56%

2. The active manager's regrettable factor bets resulted in a return of -1.16% relative to the benchmark. However, the manager's superior security selection return of +0.56% resulted in a total active return of -0.60% relative to the benchmark.

Risk Attribution

Active risk (also known as *tracking error* or *tracking risk*) is defined as the standard deviation of the active return:

$$\text{Active risk} = \text{tracking error} = \sigma(R_P - R_B)$$

The active risk of a portfolio can be separated into two components:

1. **Active factor risk:** Risk from active factor tilts attributable to deviations of the portfolio's factor sensitivities from the benchmark's sensitivities to the same set of factors.
2. **Active specific risk:** Risk from active asset selection attributable to deviations of the portfolio's individual asset weightings versus the benchmark's individual asset weightings, after controlling for differences in factor sensitivities of the portfolio versus the benchmark.

The sum of active factor risk and active specific risk is equal to active risk squared (which is the variance of active returns):

$$\text{active risk squared} = \text{active factor risk} + \text{active specific risk}$$

Both components contribute to deviations of the portfolio's returns from the benchmark's returns. For example, consider a fundamental factor model that includes industry risk factors. In this case, active risk can be described as follows:

- **Active factor risk example:** A portfolio manager may decide to under- or overweight particular industries relative to the portfolio's benchmark. Therefore, the portfolio's industry factor sensitivities will not coincide with those of the benchmark, and, consequently, the portfolio returns may deviate from the benchmark.
- **Active specific risk example:** The active portfolio manager may decide to overweight or underweight individual stocks within specific industries. For example, a stock's market capitalization may comprise 1% of the industry, but the portfolio manager may allocate 2% of industry allocation to the stock, causing the portfolio returns to deviate from the benchmark returns.

Active specific risk can be computed as:

$$\text{active specific risk} = \sum_{i=1}^N (W_{pi} - W_{bi})^2 \sigma_{ei}^2$$

where:

W_{pi} and W_{bi} = weight of i th security in the active and benchmark portfolio, respectively

σ_{ei}^2 = residual (i.e., unsystematic) risk of the i th asset

Active factor risk represents the risk explained by deviation of the portfolio's factor exposures relative to the benchmark and is computed as the residual (plug):

$$\text{active factor risk} = \text{active risk squared} - \text{active specific risk}$$

EXAMPLE: Risk decomposition

Steve Martingale, CFA, is analyzing the performance of three actively managed mutual funds using a two-factor model. The results of his risk decomposition are shown in the following table:

Fund	Active Factor			Active Specific	Active Risk Squared
	Size Factor	Style Factor	Total Factor		
Alpha	6.25	12.22	18.47	3.22	21.69
Beta	3.20	0.80	4.00	12.22	16.22
Gamma	17.85	0.11	17.96	19.7	37.66

1. Which fund assumes the highest level of active risk?
2. Which fund assumes the highest level of style factor risk as a proportion of active risk?
3. Which fund assumes the highest level of size factor risk as a proportion of active risk?
4. Which fund assumes the lowest level of active specific risk as a proportion of active risk?

Answer:

The following table shows the proportional contributions of various sources of active risk as a proportion of active risk squared. For example, the proportional contribution of style factor risk for Alpha fund can be calculated as $12.22 / 21.69 = 56\%$.

Fund	Active Factor			Active Specific	Active Risk
	Size Factor	Style Factor	Total Factor		
Alpha	29%	56%	85%	15%	4.7%
Beta	20%	5%	25%	75%	4.0%
Gamma	47%	0%	48%	52%	6.1%

1. The Gamma fund has the highest level of active risk (6.1%). Note that active risk is the square root of active risk squared (as given).
2. The Alpha fund has the highest exposure to style factor risk as seen by 56% of active risk being attributed to differences in style.
3. The Gamma fund has highest exposure to size factor as a proportion of total active risk (47%) compared to the other two funds.
4. The Alpha fund has the lowest exposure to active specific risk (15%) as a proportion of total active risk.

Uses of Multifactor Models

Multifactor models can be useful, for example, to a passive manager who seeks to replicate the factor exposures of a benchmark, or to an active manager who seeks to make directional bets on specific factors. Specific applications of multifactor models include:

1. *Passive management.* Managers seeking to track a benchmark can construct a **tracking portfolio**. Tracking portfolios have a deliberately designed *set* of factor exposures. That is, a tracking portfolio is intentionally constructed to have the same set of factor exposures to match (track) a predetermined benchmark.
2. *Active management.* Active managers use factor models to make specific bets on desired factors while hedging (or remaining neutral) on other factors. A *factor portfolio* is a portfolio that has been constructed to have sensitivity of one to just one risk factor and sensitivities of zero to the remaining factors. Factor portfolios are particularly useful for speculation or hedging purposes. For example, suppose that a portfolio manager believes GDP growth will be stronger than expected but wishes to hedge against all other factor risks. The manager can take a long position in the GDP factor portfolio; the factor portfolio is exposed to the GDP risk factor, but has zero sensitivity to all other risk factors. This manager is speculating that GDP will rise beyond market expectations.

Alternatively, consider a manager who wishes to hedge his portfolio against GDP factor risk. Imagine that the portfolio's GDP factor sensitivity equals 0.8, and the portfolio's sensitivities to the remaining risk factors are different from zero. Suppose the portfolio manager wishes to hedge against GDP risk but remain exposed to the remaining factors. The manager can hedge against GDP risk by taking an 80% short position in the GDP factor portfolio. The 0.8 GDP sensitivity of the managed portfolio will be offset by the -0.8 GDP sensitivity from the short position in the GDP factor portfolio.
3. *Rules-based or algorithmic active management (alternative indices).* These strategies use rules to mechanically tilt factor exposures when constructing portfolios. These strategies introduce biases in the portfolio relative to value-weighted benchmark indices.

We will use the Carhart model to illustrate the use of factor portfolios.

Carhart Model

The Carhart four-factor model is a multifactor model that extends the Fama and French three-factor model to include not only market risk, size, and value as relevant factors, but also momentum.

$$E(R) = R_f + \beta_1 R_{MRF} + \beta_2 SMB + \beta_3 HML + \beta_4 WML$$

where:

$E(R)$ = expected return

R_f = risk-free rate of return

R_{MRF} = return on value-weighted equity index – the risk-free rate

SMB = average return on small cap stocks – average return on large cap stocks

HML = average return on high book-to-market stocks – average return on low book-to-market stocks

WML = average returns on past winners – average returns on past losers

EXAMPLE: Factor portfolios

Sam Porter is evaluating three portfolios based on the Carhart model. The following table provides the factor exposures of each of these portfolios to the four Carhart factors.

Portfolio	Risk Factor			
	RMRF	SMB	HML	WML
Eridanus	1.0	0.0	0.0	0.0
Scorpius	0.0	1.0	0.0	0.0
Lyra	1.2	0.0	0.2	0.8

Which strategy would be *most* appropriate if the manager expects that:

1. RMRF will be higher than expected.
2. Large cap stocks will outperform small cap stocks.

Answer:

1. The manager would go long in the Eridanus portfolio as it is constructed to have exposure only to the RMRF factor. The Lyra portfolio would not be ideal for Porter's purpose because it provides unneeded exposures to the HML and WML factors as well.
2. The manager would go short the Scorpius portfolio, which is constructed to be a pure bet on SMB (i.e., Scorpius is a factor portfolio). We short the portfolio because we are expecting that large cap stocks will outperform small cap stocks.

LOS 36.f: Describe the potential benefits for investors in considering multiple risk dimensions when modeling asset returns.

Under the CAPM framework, investors choose a combination of the market portfolio and the risk-free asset depending on their risk tolerance. By including more risk factors, multifactor models enable investors to zero in on risks that the investor has a comparative advantage in bearing and avoid the risks that the investor is incapable of absorbing. For example, a pension plan invests for long-term and, hence, would not be averse to holding a security that bears liquidity risk (and that offers a liquidity risk premium).

Also, if the actual asset returns are better described by multifactor models, then using such models can help investors select more efficient portfolios.

LOS 36.g: Explain sources of active risk and interpret tracking risk and the information ratio.

The Information Ratio

Active return alone is insufficient for measuring an investment manager's performance over a series of measurement periods. For example, imagine that Manager A earned a constant 0.5% (50 bps) active return over each of the last four quarters. Furthermore, suppose Manager B earned active returns of 8%, 5%, -3%, and -8% over the same four quarters. The average active returns for managers A and B are both 0.5%, but Manager B experienced far more volatility (i.e., less consistency) than Manager A.

To demonstrate a manager's consistency in generating active return, we use the *information ratio*, which standardizes average active return by dividing it by its standard deviation. In other words, the historical or ex-post information ratio equals the portfolio's average active return divided by the portfolio's tracking risk:

$$IR = \frac{\bar{R}_P - \bar{R}_B}{\sigma_{(R_P - R_B)}}$$

EXAMPLE: Calculating the information ratio

Imagine that the portfolio and benchmark returns over the past 12 months have been as shown in the following table.

Portfolio and Benchmark Returns for Twelve Months

Month	R_P	R_B	$R_P - R_B$
1	0.0101	0.0091	0.0010
2	-0.0013	0.0062	-0.0075
3	0.0110	0.0069	0.0041
4	0.0135	0.0071	0.0064
5	0.0103	0.0067	0.0036
6	0.0093	0.0051	0.0042
7	-0.0011	0.0007	-0.0018
8	0.0085	0.0105	-0.0020
9	0.0091	0.0101	-0.0010
10	-0.0073	-0.0030	-0.0043
11	0.0186	0.0012	0.0174
12	<u>0.0103</u>	<u>0.0097</u>	<u>0.0006</u>
Average	0.0076	0.0059	0.0017
		Sample Std. Dev.	0.0063

Given the data in the table, calculate and interpret the manager's information ratio.

Answer:

$$IR = \frac{(\bar{R}_P - \bar{R}_B)}{\sigma_{(R_P - R_B)}} = \frac{0.0076 - 0.0059}{0.0063} \approx 0.27$$

The higher the IR, the more active return the manager earned per unit of active risk. An information ratio of 0.27 indicates the manager earned about 27 basis points of active return per 1 percent of active risk.



PROFESSOR'S NOTE

The information ratio is similar to the Sharpe ratio, in that their numerators both compare average portfolio return to a benchmark. One difference is that the Sharpe ratio uses the risk-free rate as the benchmark, while the IR uses a portfolio benchmark return (one that best matches the investment style of the managed portfolio). Furthermore, the Sharpe ratio uses the standard deviation of portfolio total returns in the denominator, while the information ratio uses the standard deviation of the active (vs. the benchmark) return.



MODULE QUIZ 36.3

1. A multifactor model to evaluate style and size exposures (e.g., large cap value) of different mutual funds would be *most appropriately* called a:
A. systematic factor model.
B. fundamental factor model.
C. macroeconomic factor model.
2. A portfolio that has the same factor sensitivities as the S&P 500, but does not hold all 500 stocks in the index, is *best* described as a:
A. factor portfolio.
B. tracking portfolio.
C. market portfolio.
3. A portfolio with a factor sensitivity of one to the yield spread factor and a sensitivity of zero to all other macroeconomic factors is *best* described as a:
A. factor portfolio.
B. tracking portfolio.
C. market portfolio.
4. Factor Investment Services, LLC manages a tracking portfolio that claims to outperform the S&P 500. The active factor risk and active specific risk for the tracking portfolio are *most likely* to be described as:
A. high active factor risk and high active specific risk.
B. high active factor risk and low active specific risk.
C. low active factor risk and high active specific risk.
5. Relative to the CAPM, the *least likely* advantage of multifactor models is that multifactor models help investors to:
A. target risks that the investor has a comparative advantage in bearing.
B. select an appropriate proportion of the portfolio to allocate to the market portfolio.
C. assemble more efficient and better diversified portfolios.

KEY CONCEPTS

LOS 36.a

The arbitrage pricing theory (APT) describes the equilibrium relationship between expected returns for well-diversified portfolios and their multiple sources of systematic risk. The APT makes only three key assumptions: (1) unsystematic risk can be diversified away in a portfolio, (2) returns are generated using a factor model, and (3) no arbitrage opportunities exist.

LOS 36.b

An arbitrage opportunity is defined as an investment opportunity that bears no risk and has no cost, but provides a profit. Arbitrage is conducted by forming long and short portfolios; the proceeds of the short sale are used to purchase the long portfolio. Additionally, the factor sensitivities (betas) of the long and short portfolios are identical and, hence, our net exposure to systematic risk is zero. The difference in returns on the long and short portfolios is the arbitrage return.

LOS 36.c

$$\text{Expected return} = \text{risk-free rate} + \sum (\text{factor sensitivity}) \times (\text{factor risk premium})$$

LOS 36.d

A multifactor model is an extension of the one-factor market model; in a multifactor model, asset returns are a function of more than one factor. There are three types of multifactor models:

- Macroeconomic factor models assume that asset returns are explained by surprises (or shocks) in macroeconomic risk factors (e.g., GDP, interest rates, and inflation). Factor surprises are defined as the difference between the realized value of the factor and its consensus expected value.
- Fundamental factor models assume asset returns are explained by the returns from multiple firm-specific factors (e.g., P/E ratio, market cap, leverage ratio, and earnings growth rate).
- Statistical factor models use multivariate statistics (factor analysis or principal components) to identify statistical factors that explain the covariation among asset returns. The major weakness is that the statistical factors may not lend themselves well to economic interpretation.

LOS 36.e

Multifactor models can be useful for risk and return attribution and for portfolio composition. In return attribution, the difference between an active portfolio's return and the benchmark return is allocated between factor return and security selection return.

$$\text{factor return} = \sum_{i=1}^k (\beta_{pi} - \beta_{bi}) \times (\lambda_i)$$

In risk attribution, the sum of the active factor risk and active specific risk is equal to active risk squared (which is the variance of active returns):

$$\text{active risk squared} = \text{active factor risk} + \text{active specific risk}$$

$$\text{active specific risk} = \sum_{i=1}^n (W_{pi} - W_{bi})^2 \sigma_{ei}^2$$

$$\text{active factor risk} = \text{active risk squared} - \text{active specific risk}$$

Multifactor models can also be useful for portfolio construction. Passive managers can invest in a tracking portfolio, while active managers can go long or short factor portfolios.

A factor portfolio is a portfolio with a factor sensitivity of 1 to a particular factor and zero to all other factors. It represents a pure bet on a single factor and can be used for speculation or hedging purposes. A tracking portfolio is a portfolio with a specific set of factor sensitivities. Tracking portfolios are often designed to replicate the factor exposures of a benchmark index like the S&P 500.

LOS 36.f

Multifactor models enable investors to take on risks that the investor has a comparative advantage in bearing and avoid the risks that the investor is unable to absorb.

Models that incorporate multiple sources of systematic risk have been found to explain asset returns more effectively than single-factor CAPM.

LOS 36.g

Active return is the difference between portfolio and benchmark returns ($R_P - R_B$), and active risk is the standard deviation of active return over time. Active risk is determined by the manager's active factor tilt and active asset selection decisions:

$$\text{active risk squared} = \text{active factor risk} + \text{active specific risk}$$

The information ratio is active return divided by active risk:

$$IR = \frac{\bar{R}_P - \bar{R}_B}{\sigma(R_P - R_B)}$$

ANSWER KEY FOR MODULE QUIZZES

Module Quiz 36.1

- C** The assumptions of APT include (1) unsystematic risk can be diversified away in a portfolio, (2) returns can be explained by a factor model, and (3) no arbitrage opportunities exist. However, arbitrage does not cause the risk premium for systematic risk to be zero. (LOS 36.a)
- C** An arbitrage portfolio comprises long and short positions such that the net return is positive yet the net factor sensitivity is zero. In this question, the low expected return of Portfolio C per unit of factor sensitivity indicates that Portfolio C should be shorted. Suppose that we arbitrarily assign Portfolio C a 100% short weighting and, furthermore, we assign a weighting of w to Portfolio A and a weighting of $(1 - w)$ to Portfolio B. Because the weighted sum of long and short factor sensitivities must be equal, we develop the following equation: $w \times 1.20 + (1 - w) \times 2.00 = 1.00 \times 1.76$. Solving algebraically for w gives a 30% long weight on Portfolio A, a 70% long weight on Portfolio B, and a 100% short weight on Portfolio C. The factor sensitivity of this portfolio will be $(0.3)(1.20) + (0.7)(2.0) - (1)(1.76) = 0$. The expected return on this zero risk, zero investment portfolio will be $(0.3)(10) + (0.7)(20) - (1)(13) = 4\%$. (LOS 36.b)
- B** Using the two-factor APT model, the expected return for stock A equals:
 $E(R_{IF}) = 0.05 + (0.88) \times (0.03) + (1.10) \times (0.01) = 0.0874 = 8.74\%$
(LOS 36.c)

Module Quiz 36.2

- A** The two-factor model for AG is $R_{AG} = 0.10 + 2(-0.02) - 0.50(0.02) - 0.04 = 0.01 = 1\%$

The AG return was less than originally expected because AG was hurt by lower-than-expected economic growth (GDP), higher-than-expected inflation, and a negative company-specific surprise event. (LOS 36.d)

Module Quiz 36.3

- B** Style (e.g., value versus growth) can be evaluated based on company-specific fundamental variables such as P/E or P/B ratio. Size is generally proxied by

market capitalization. A fundamental factor model is appropriate when the underlying variables are company-specific. (LOS 36.e)

2. **B** A *tracking portfolio* is a portfolio with a specific set of factor sensitivities. Tracking portfolios are often designed to replicate the factor exposures of a benchmark index like the S&P 500—in fact, a factor portfolio is just a special case of a tracking portfolio. One use of tracking portfolios is to attempt to outperform the S&P 500 by using the same factor exposures as the S&P 500 but with a different set of securities than the S&P 500. (LOS 36.e)
3. **A** A *factor portfolio* is a portfolio with a factor sensitivity of 1 to a particular factor and zero to all other factors. It represents a *pure bet* on that factor. For example, a portfolio manager who believes GDP growth will be greater than expected, but has no view of future interest rates and wants to hedge away the interest rate risk in her portfolio, could create a *factor portfolio* that is only exposed to the GDP factor and not exposed to the interest rate factor. (LOS 36.e)
4. **C** A tracking portfolio is deliberately constructed to have the same set of factor exposures to match (track) a predetermined benchmark. The strategy involved in constructing a tracking portfolio is usually an active bet on asset selection (the manager claims to beat the S&P 500). The manager constructs the portfolio to have the same factor exposures as the benchmark, but then selects superior securities (subject to the factor sensitivities constraint), thus outperforming the benchmark without taking on more systematic risk than the benchmark. Therefore, a tracking portfolio, with active asset selection but with factor sensitivities that match those of the benchmark, will have little or no active factor risk, but will have high active specific risk. (LOS 36.e)
5. **B** Multifactor models enable investors to zero in on risks that the investor has a comparative advantage in bearing and avoid the risks that the investor is unable to take on. Multifactor models are preferred over single factor models like CAPM in cases where the underlying asset returns are better described by multifactor models. Allocation of an investor's portfolio between the market portfolio and the risk-free asset is part of CAPM, not multifactor models. (LOS 36.f)

READING 37

MEASURING AND MANAGING MARKET RISK

EXAM FOCUS

This topic review discusses different approaches to risk measurement as well as mechanisms to manage and control risk. VaR is an important risk metric, and you should know different ways to compute it as well as pros and cons of different approaches. Also know the limitations of VaR as a risk metric and the variations of VaR. The discussion on scenario and sensitivity analysis is mostly qualitative. Finally, know the risk measures that are more relevant for different asset managers, such as banks, pension funds, et cetera.

MODULE 37.1: VALUE AT RISK (VaR)



Video covering
this content is
available online.

LOS 37.a: Explain the use of value at risk (VaR) in measuring portfolio risk.

Value at risk (VaR) measures downside risk of a portfolio. It has three components: the loss size, the probability (of a loss greater than or equal to the specified loss size), and a time frame. Consider the statement: "There is a 5% probability that the company will experience a loss of \$25,000 or more in any given month." This is the same as stating that the monthly 5% VaR is \$25,000. In the previous statement, the probability is 5%, the loss size is \$25,000, and the time frame is one month.

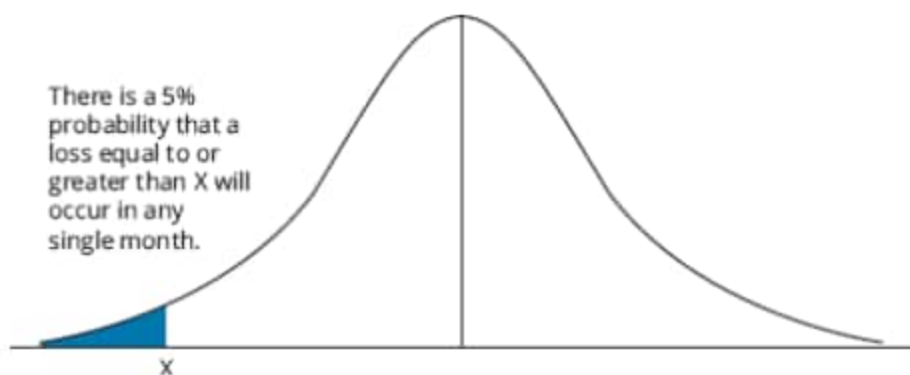
Note that \$25,000 is a *minimum* loss amount, so we can state, "5% of the time the minimum monthly loss that the company will experience is \$25,000."

VaR can also be expressed in percentage terms so that for a portfolio, we could state that the 5% monthly VaR is 3%, meaning that 5% of the time the monthly portfolio value will fall by *at least* 3%. We can also state VaR as a confidence level: we are 95% (i.e., 100% – 5%) confident that the portfolio will experience a loss of no more than 3%.

To estimate a VaR, we must specify the time period and the size of the loss, so there is significant judgment involved in VaR estimation. If we choose the size of the loss, we will estimate the probability of losses of that size or larger; but, if we choose the probability of the loss, we will estimate the minimum size of the losses that will occur with that probability.

Figure 37.1 shows the 5% VaR for a given probability distribution of monthly returns. *The 5% left-hand tail of the distribution of possible monthly outcomes is bounded by the 5% VaR; VaR is the upper limit of the specified left tail.*

Figure 37.1: Distribution of Monthly Returns



While any probability can be specified, VaR is typically expressed for 1%, 5%, or 16% (one standard deviation below the mean for a normal distribution) probability. The time frame specified also varies; we could estimate VaR for a day, a week, a month, or any other relevant period.

LOS 37.b: Compare the parametric (variance-covariance), historical simulation, and Monte Carlo simulation methods for estimating VaR.

LOS 37.c: Estimate and interpret VaR under the parametric, historical simulation, and Monte Carlo simulation methods.

The first step in estimating the VaR for a portfolio is to identify the risk factors that enter into the determination of portfolio returns. These risk factors might include market risk, interest rate risk, or currency risk, among others.

One method of estimating VaR is the **parametric** or **variance-covariance** method. Often we assume that the risk factors are distributed normally, but we could also assume other distributions. Assuming normality allows us to estimate the risk of the portfolio based only on the means, variances, and covariances (or correlations) of the various risk factors. An assumption that risk factor probabilities are non-normal would increase the complexity of the analysis and require that we estimate values for other parameters, such as skewness and kurtosis.

Assuming normality, we can use the portfolio variance formula to estimate the mean and variance of portfolio returns. Once we have estimated these parameters, we can identify portfolio VaR as the value bounding the left-hand tail of the distribution, as we illustrated in Figure 37.1. To simplify the explanation of the parametric method, we will consider a case of only two risk factors, both of which are normally distributed.

Consider two securities, asset A and asset B. For a portfolio with portfolio fraction W_A invested in asset A and the remaining portfolio fraction W_B invested in asset B, portfolio variance is given by the formula:

$$\sigma_{\text{Portfolio}}^2 = W_A^2 \sigma_A^2 + W_B^2 \sigma_B^2 + 2W_A W_B \text{Cov}_{AB}$$

The returns period that we use to estimate the mean and standard deviation of returns for each risk factor (each fund in our example) is called the **lookback period**. For estimating the variance of daily returns, we might use the last two years; but, for estimating the variance of annual returns, we would choose a longer lookback period. The important point is that the parameter estimates we use should be those we expect over the period for which we are estimating the VaR. Estimates based on recent periods may be adjusted towards longer-term averages.

EXAMPLE: Estimating VaR

Imagine that we are provided the following information about two assets, Security A and Security B:

Security	Standard deviation of daily returns	Mean daily return	Covariance of daily returns
Security A	0.0158	0.0004	0.000106
Security B	0.0112	0.0003	

How would we use this information to estimate the 5% annual VaR for a portfolio that is 60% invested in Security A and 40% invested in Security B?

Answer:

$$\text{Mean daily portfolio return} = 0.6(0.0004) + 0.4(0.0003) = 0.00036$$

$$\text{Variance of portfolio return} = (0.6)^2(0.0158)^2 + (0.4)^2(0.0112)^2 + 2(0.4)(0.6)(0.000106) = 0.000161$$

$$\text{Standard deviation of portfolio returns} = \sqrt{0.000161} = 0.012682$$

For a 5% VaR we want 5% in the left-hand tail, so we calculate the value 1.65 standard deviations below the mean:

$$5\% \text{ daily VaR} = [0.00036 - 1.65(0.012682)] \times (-1) = 0.0206$$

Assuming the distribution of daily returns is constant over the year, that there are 250 trading days in one year, and that daily returns are independently distributed, we can calculate the annual mean return as $250(0.00036) = 0.09$.

The annual standard deviation can be calculated as $\sqrt{250}(0.012682) = 0.20052$.

Based on these estimates, the 5% *annual VaR* = $[0.09 - 1.65(0.20052)] \times (-1) = 0.2409$.

For a portfolio with a value of \$10 million, the 5% daily and annual VaR are:

$$10 \text{ million } (0.0206) = \$206,000 \text{ and}$$

$$10 \text{ million } (0.2409) = \$2,409,000.$$

The parametric method is relatively simple to apply under the assumption of normally distributed returns. Of course, its estimates will only be as good as the estimates of future mean returns and standard deviations. The calculated VaR is also very sensitive to the covariance estimate. The length of the lookback period will affect the parameter estimates, and care must be taken to adjust estimates based on recent results when they may not reflect the future distribution of returns. In cases where normality cannot be reasonably assumed, such as when the portfolio contains options, the parametric method has limited usefulness.

The **historical simulation method** of estimating VaR is based on the actual periodic changes in risk factors over a lookback period. For a daily VaR, the change in the value of the current portfolio is calculated for each day of the lookback period, using the actual daily changes in portfolio value. By ordering the changes in portfolio value from most positive to most negative, we can find the largest 5% of losses. The smallest of those losses is our estimate of the 5% VaR for the current portfolio.

Under the historical simulation method, no adjustments are made for the difference between the results for the lookback period and the results over a longer prior period.

One positive aspect of the historical simulation method is that we do not need the assumption of normality, or any other distributional assumption, to estimate VaR. Because the historical results for a portfolio containing options include the changes in option values, the historical simulation method can be used to estimate the VaR for portfolios that include options.

VaR estimates will depend on the lookback period and, as with any forecasts, will vary with the characteristics of the sample data used. VaR based on an unusually volatile lookback period will yield overestimates of VaR, just as VaR based on a lookback period with low volatility will likely underestimate the true VaR over subsequent periods.

A third method of VaR estimation is **Monte Carlo simulation**. Monte Carlo simulation is based on an assumed probability distribution for each risk factor. Additionally, an assumption must be made about the correlations between risk factors. Computer software is used to generate random values for each risk factor, and pricing models are used to calculate the change in portfolio value for that set of risk factor changes.

This procedure is repeated thousands of times. Then, just as with historical simulation, we can order the outcomes and identify the fifth percentile (i.e., a value for which 5% of the outcomes will be lower) to estimate the 5% VaR. As with the other methods, the data used and the assumptions about the distributions of the risk factors will have significant effects on the estimated VaR. Assuming a large sample size, the Monte Carlo method will produce identical results as the parametric method if the distribution specified and the parameters are the same.



MODULE QUIZ 37.1

- Weekly 5% VaR of £1 million indicates:
 - a maximum allowable loss of £1 million in 5% of weeks.
 - that the largest weekly loss is £1 million or 5% of portfolio value.
 - a 5% probability of a loss greater than £1 million in any given week.
- A lookback period is *least likely* to be specified when estimating VaR using:
 - historical simulation.
 - the parametric method.
 - Monte Carlo simulation.
- A portfolio manager expects to earn a return of 6.5% over the next year with a standard deviation of 9%. The portfolio is currently valued at \$6.4 million. What is the 5% annual VaR of the portfolio?
 - \$83,500.

- B. \$160,000.
- C. \$534,400.

MODULE 37.2: USING VaR



Video covering
this content is
available online.

LOS 37.d: Describe advantages and limitations of VaR.

VaR, as a measure of portfolio risk, has many benefits but suffers from the same limitations as many other forward-looking estimates of portfolio risk.

ADVANTAGES OF VaR

- The concept of VaR is simple and easy to explain, although the details of the methodology can be complex.
- VaR allows the risk of different portfolios, asset classes, or trading operations to be compared to gain a sense of relative riskiness.
- VaR can be used for performance evaluation (i.e., returns generated vs. risk taken). Rather than evaluating a trading group's performance based only on returns, VaR allows calculation of the ratio of trading income to VaR.
- When allocating capital to various trading units, a firm's risk managers can also look at the allocation of VaR and optimize the allocation of capital given the firm's determination of the maximum VaR that the organization should be exposed to (sometimes referred to as *risk budgeting*). In the same manner, managers can estimate risk-adjusted performance of trading units or profits per dollar of VaR. For example, the equity trading desk may be assigned a maximum daily VaR of \$5 million while the more profitable currency trading desk may be assigned a daily VaR of \$15 million.
- Global banking regulators accept VaR as a measure of financial risk, although they do not prescribe estimation methods or impose a maximum VaR.
- Reliability of VaR as a measure of risk can be verified by backtesting.

LIMITATIONS OF VaR

- VaR estimation requires many choices (loss percentage, lookback period, distribution assumptions, and parameter estimates) and can be very significantly affected by these choices. An unscrupulous analyst can choose assumptions that lead to a low estimate of VaR.
- The assumption of normality leads to underestimates of downside (tail) risk because actual returns distributions frequently have "fatter tails" than a normal distribution. When this is the case, VaRs based on an assumption of normality tend to underestimate the probability of extreme outcomes. Although the assumption of normality is not a requirement of VaR, it is almost always used, especially with the parametric method.
- Liquidity often falls significantly when asset prices fall. A VaR which does not account for this will understate the actual losses incurred when liquidating positions that are under extreme price pressure.

- It is well known that correlations increase, or spike, during periods of financial stress. Increasing correlations mean that VaR measures based on normal levels of correlation will overestimate diversification benefits and underestimate the magnitude of potential losses.
- While VaR is a single number that can be used to quantify risk, as with any summary measure, many aspects of risk are not quantified or included. Users of VaR must understand the limitations of VaR as a measure of risk in order to use it appropriately.
- VaR focuses only on downside risk and extreme negative outcomes. Including consideration of right-hand tail values will give a better understanding of the risk-return trade-off.

LOS 37.e: Describe extensions of VaR.

Another measure based on VaR is the **conditional VaR (CVaR)**. The CVaR is the expected loss, given that the loss is equal to or greater than the VaR. For this reason, the CVaR is also referred to as the *expected tail loss* or *expected shortfall*. The CVaR is expected loss given that the loss is in the left-hand tail past the VaR.

When the VaR is estimated using the historical simulation method or Monte Carlo simulation, we have all the losses greater than the VaR loss, so it is straightforward to take the average of these to get the CVaR. With the parametric method, we don't know the magnitude of losses greater than the VaR, so calculating the expected loss in the left-hand tail is mathematically complex.

Incremental VaR (IVaR) is the change in VaR from a change in the portfolio allocation to a security. If a 2% increase in the weight of a security in the portfolio increases the portfolio's VaR from \$1,345,600 to \$1,562,400, the IVaR for the 2% increase in the portfolio weight of the security is $1,562,400 - 1,345,600 = \$216,800$.

A related measure is the **marginal VaR (MVar)**. The MVar is estimated as the slope of a curve that plots VaR as a function of a security's weight in the portfolio. The MVar is calculated at the point on the curve corresponding to the security's current weight, so we can interpret it as the change in VaR for a 1% increase in the security's weight. This is not precisely correct because the MVar is the slope at a point on the curve, not the slope for a 1% change in weight. It is, however, a reasonable approximation of the sensitivity of VaR to a 1% change in weight of a security. Thus, both the MVar and IVaR can be used to estimate the change in VaR that will result from a change in the weight of a single security.

Ex ante tracking error, also referred to as **relative VaR**, measures the VaR of the difference between the return on a portfolio and the return on its manager's benchmark portfolio. A 5% monthly relative VaR of 2.5% implies that 5% of time, the portfolio's relative underperformance will be at least 2.5%. The relative VaR can be calculated as the VaR of a combination of a long position in the subject portfolio and a short position in the benchmark portfolio.

LOS 37.f: Describe sensitivity risk measures and scenario risk measures and compare these measures to VaR.

Given the limitations of VaR as a risk measure, analysts should use other risk measures that complement VaR.

Risk assessment using **sensitivity analysis** focuses on the effect on portfolio value given a small change in one risk factor. By examining the sensitivity of a portfolio's value to several risk factors, portfolio risk can be better understood and more effectively managed. Sensitivity analysis complements VaR in understanding portfolio risk, but, unlike VaR, it does not involve any prediction of the probability of losses of any specific amount.

While sensitivity analysis provides an estimate of the change in portfolio value due to a small change in a single risk factor, **scenario analysis** provides an estimate of the effect on portfolio value of a set of changes of significant magnitude in multiple risk factors. The changes in risk factors used in scenario analysis are often a set of changes that are expected to result in a significant decline in portfolio value, although a scenario of changes in risk factors that would increase portfolio value may also be considered.

A **historical scenario** approach uses a set of changes in risk factors that have actually occurred in the past, especially changes during a period of financial disruption and stress such as the subprime mortgage crisis of 2008 or the equity market crash of 1987.

With a **hypothetical scenario** approach, any set of changes in risk factors can be used, not just one that has happened in the past. A hypothetical scenario could have more extreme changes in risk factors than those that have occurred in the past, but that have some non-zero probability of occurring in the future.

Stress tests examine the effect on value (or solvency) of a scenario of extreme risk-factor changes.

LOS 37.g: Demonstrate how equity, fixed-income, and options exposure measures may be used in measuring and managing market risk and volatility risk.

The risk factors used to measure the risks of equities, fixed-income securities, and options are all different. For equities, the most often used risk factor is **beta**. Beta is a measure of how the returns of a security or a portfolio are expected to be affected by overall market returns. The capital asset pricing model (CAPM) is based on market risk as measured by beta and concludes that the expected return on an asset is equal to the risk-free rate plus beta times the market risk premium:

$$E(R_i) = R_f + \text{Beta}_i [E(R_{\text{MKT}}) - R_f]$$

For fixed-income securities and portfolios, **duration** provides an estimate of how market values are affected by changes in interest rates (yields to maturity). For larger changes in interest rates, including the effects of **convexity** on fixed-income

security values improves estimates of the sensitivity of the values of fixed-income securities to changes in interest rates. Together, duration and convexity are used to estimate the sensitivity of the values of fixed-income securities (and portfolios) to changes in interest rates. An estimate of the percentage change in value of a fixed-income security or portfolio in response to a change in YTM (ΔY) is given by:

$$\text{Change in price} = -\text{Duration} (\Delta Y) + \frac{1}{2} \text{Convexity} (\Delta Y)^2$$



PROFESSOR'S NOTE

If duration in the previous equation is Macaulay duration (rather than modified duration), ΔY is replaced by $\Delta Y/(1 + Y)$.

Several risk factors affect the values of options positions. **Delta** is an estimate of the sensitivity of options values to changes in the value of the underlying asset. Delta is the ratio of the change in an option's value to a change in the price of the underlying security. A call delta of 0.6 means that for every \$1 increase in the price of the underlying asset, the call value increases by \$0.60. A put delta of -0.5 means that for every \$1 increase the value of the underlying asset, the put value will decrease by \$0.50.

Gamma is an estimate of how delta changes as the price of the underlying asset changes and is calculated as the ratio of the *change in delta* to a change in the price of the underlying asset. Just as convexity improves estimates of the impact of interest rate changes captured by delta, gamma improves estimates of the impact of a change in the price of the underlying asset on option values. Both convexity and gamma are considered *second-order effects*, while duration and delta measure first-order effects of risk factor changes.

Vega is a measure of the sensitivity of option values to changes in the expected volatility of the price of the underlying asset. We can incorporate all three of these option risk measures in the following equation:

$$\text{Change in call price} = \text{delta} (\Delta S) + \frac{1}{2} \text{gamma} (\Delta S)^2 + \text{vega} (\Delta V)$$

where ΔS is the change in the price of the underlying asset and ΔV is the change in future volatility.



MODULE QUIZ 37.2

- Which of the following is a limitation of VaR?
 - VaR focuses on downside risk.
 - Use of VaR is discouraged by banking regulators.
 - Estimates of VaR for different asset classes are not comparable.
- The expected amount of a loss, given that it is equal to or greater than the VaR, is the:
 - marginal VaR.
 - conditional VaR.
 - incremental VaR.
- The sensitivity of an option value to changes in volatility of the underlying asset price is measured by:
 - beta.
 - vega.
 - gamma.



MODULE 37.3: SENSITIVITY AND SCENARIO RISK MEASURES

Video covering this content is available online.

LOS 37.h: Describe the use of sensitivity risk measures and scenario risk measures.

Sensitivity risk measures can inform a portfolio manager about a portfolio's exposure to various risk factors to facilitate risk management. Exposure to risks the manager believes are excessive can be reduced (i.e., hedged). Of course, eliminating all risk is not the goal; portfolios not exposed to risk can be expected to earn only the risk-free rate of return.

When using scenario analysis for a portfolio that contains options or fixed-income securities with embedded options, the individual options and bonds must be valued with a pricing model using scenario values for the risk factors. Factor sensitivities can be used to estimate the effects of small changes in risk factors for these securities; for larger risk factor changes, pricing models for portfolio securities must be used. Even combining first-order and second-order effects, such as duration and convexity, only provides an approximation of the change in value that would result from a relatively large change in a risk factor.

Pricing models can be quite accurate when all of the relevant characteristics of a security are specified. With scenario analysis, each portfolio security is model-priced using the risk factor values of a particular scenario in order to estimate the scenario impact on portfolio value. A **scenario risk measure** estimates the portfolio return that would result from either a hypothetical market event or the recurrence of an actual historical event.

Scenario analysis is often performed as if the scenario changes were instantaneous. In some cases, scenario changes are modeled as incremental changes, and the scenario includes portfolio manager actions in response to each, perhaps daily, incremental change in the set of risk factors. The idea is to allow for the reduction or closing of some positions or adjusting hedges appropriately. Because such actions will reduce the overall impact of the scenario changes, scenario analysis based on an instantaneous change in risk factors is considered more conservative. It is also more realistic in circumstances where, for example, counterparties are unable or unwilling to provide additional collateral required or lack of liquidity makes changing portfolio positions very costly or impossible.

In **reverse stress testing**, the first step is to identify a portfolio's largest risk exposures. Then an unacceptable outcome is determined (usually one that would threaten the survival of the organization), and scenarios of changes in risk factors that would result in such an outcome are identified. The question then becomes how likely such scenarios are. Using scenario analysis in this way can be beneficial in helping risk managers identify the vulnerabilities of a portfolio and perhaps mitigate the risk exposures identified.

Scenario analysis can be seen as the final step in the risk assessment and management process, after performing sensitivity analysis. For a firm that has limited its risk through a maximum VaR, limits on position sizes, limits on specific

risk exposures, and so on, scenario analysis can provide additional information on a portfolio's vulnerability to a set of events or changes in correlations that would significantly reduce the value of the portfolio.

Firms that use leverage, especially banks and hedge funds, often use stress tests involving a single risk factor to determine the size of change in that factor that could cause such losses that the firm's sustainability is compromised.

LOS 37.i: Describe advantages and limitations of sensitivity risk measures and scenario risk measures.

VaR, sensitivity analysis, and scenario analysis complement each other, and a risk manager should not rely on only one of these measures. VaR provides a probability of loss. Sensitivity analysis provides estimates of the relative exposures to different risk factors, but no estimate of the probability of any specific changes in risk factors. Scenario analysis will provide information about exposure to simultaneous changes in several risk factors or changes in risk correlations, but, again, there is no probability associated with a specific scenario other than the empirical probability of a historical scenario over the lookback period.

As an example of the limitations of sensitivity analysis, consider two bond portfolios that both have the same duration, so that the change in value resulting from a one basis point change in yield is the same for both portfolios. The problem with using duration as the risk measure is that the yield volatility of one portfolio may be quite different from the yield volatility of the other. The yield volatilities of government bonds, investment-grade bonds, corporate bonds, and high-yield bonds may be quite different from each other so that the probabilities of a given percentage decrease in value are quite different as well. Similarly, option delta (or delta and gamma) may be an appropriate measure of the risk for small changes in the price of the underlying, but the volatility of the prices of the underlying may be quite different for different options.

MODULE 37.4: APPLICATIONS OF RISK MEASURES



Video covering
this content is
available online.

LOS 37.i: Describe risk measures used by banks, asset managers, pension funds, and insurers.

The risk measures used by an organization will depend on the types of risks it is exposed to, the regulations that govern it, and whether the organization uses leverage. For each type of organization, differences among firms will result in differences in the risk measures used. In what follows, we focus on similarities of risk measures used among organizations of the same type and typical differences between the risk measures used by different organizations.

Banks typically use sensitivity measures (duration of held-to-maturity securities and foreign exchange risk exposure), scenario analysis and stress testing (for their full balance sheets), leverage risk measures, and VaR (especially for trading

securities). Banks also estimate risk from asset-liability mismatches, estimate VaR for economic capital, and disaggregate risk by both geographic location and business unit type.



PROFESSOR'S NOTE

Economic capital is the amount of capital a firm needs to hold for it to survive severe losses due to the risks in its businesses.

Traditional (long-only) asset managers typically focus on relative risk measures unless their goal is an absolute return target. Typical risk measures used include the size of positions, sensitivity measures of interest rate and market risk, historical and hypothetical scenario analysis, and options risk. A risk measure more specific to asset management is **active share**: the difference between the weight of a security in the portfolio and its weight in the benchmark.

Ex-post tracking error (backward looking) and **ex ante tracking error** (forward looking) measures provide different information. Ex-post tracking error is a measure of a portfolio's tracking error relative to a benchmark portfolio over a lookback period. Ex-post tracking error is used for performance attribution and to assess manager skill over prior periods. Traditional asset managers mostly use ex ante tracking error for risk estimation, which focuses on the potential underperformance of the current (rather than a historical) portfolio. Managers with an absolute return target may use VaR instead.

For **hedge funds**, the risk measures used depend, to some extent, on the strategy employed. For hedge funds in general, the risk measures used include sensitivity analysis, leverage measures, scenario analysis, and stress tests. Funds with both long and short positions will estimate risk measures for long positions and short positions, as well as for the overall portfolio (gross exposure). Hedge funds that use VaR focus on VaR measures of less than 10% for short periods.

Hedge funds with significantly non-normal returns distributions use a risk measure referred to as *maximum drawdown*: the largest decrease in value over prior periods of a specific length. As we have noted, sensitivity measures based on standard deviation or beta may be misleading for large changes in risk factors when returns are non-normal.

Defined benefit pension funds calculate the difference between the present value of their assets (often market values) and the present value of their estimated future liabilities (payments to retirees and heirs). A risk measure used by pension funds is **surplus-at-risk**, a VaR for plan assets minus liabilities. A negative surplus must be made up by the firm if higher-than-expected asset returns do not reduce it significantly over time. The term *glide path* refers to a multi-year plan for adjusting pension fund contributions to reverse a significant overfunded or underfunded status. To reduce surplus uncertainty, a pension fund may match its assets to its liabilities. A related risk measure is an estimate of the hedged exposure and unhedged (returns-generating) exposure of the fund.

Insurance companies are often subject to significant regulation of their products and their investment portfolios (reserves). **Property and casualty insurers** sell auto, home, boat, liability, and health insurance. The insurance risks of a P&C company are not highly correlated with the market risk of their investment

portfolios. Insurance risks are reduced by purchasing reinsurance (from another insurance company) and by geographical diversification. **Life insurers** primarily sell life insurance policies and annuities, some of which make payments until the death of the annuity owner.

P&C insurers use sensitivities of their exposures to market risk factors in their investment portfolios for risk management. Premium income is expected to cover the cost of insurance claims in a typical year, with the investment portfolio available to cover extraordinary claim losses, such as those in a year with a natural disaster.

P&C insurers use VaR and capital at risk as measures of their risk exposure in their investment accounts. They also use scenario analysis, often combining portfolio risk factors and insurance risk factors in a scenario. Regulations may require specific amounts of reserves (based on policies issued), and regulators discount the values of riskier assets held as reserves in determining their adequacy.

The insurance risk of life insurers is more highly correlated with the market risk exposures of their investment portfolios than it is for P&C insurers. Because annuities pay over relatively long periods into the future, the present values of these liabilities are quite sensitive to the discount factors used, although they have significant mortality risk factors as well. (The longer a life annuity pays, the larger the current liability.) For this reason, life insurers estimate the sensitivities to market risk factors for both their investment portfolios and their annuity liabilities.

Because life insurers are able to somewhat match the market risk of their portfolio assets to their liabilities, they must consider the risk of the remaining mismatch between assets and liabilities. Life insurers also use scenario analysis that includes both nonmarket (insurance) risk factors and market risk factors.



MODULE QUIZ 37.3, 37.4

1. Which of the following risk measures is *most likely* to be used by a traditional asset manager?
 - A. Active share.
 - B. Surplus at risk.
 - C. Maximum drawdown.
2. The risk measure of volatility of surplus would most likely be used by a:
 - A. bank.
 - B. pension fund.
 - C. life insurance company.

MODULE 37.5: CONSTRAINTS AND CAPITAL ALLOCATION DECISIONS



Video covering
this content is
available online.

LOS 37.j: Explain constraints used in managing market risks, including risk budgeting, position limits, scenario limits, and stop-loss limits.

Constraints imposed to limit risk can be too restrictive, impairing profitability, or not restrictive enough, leading to financial stress, corporate reorganization, or bankruptcy. Imposing restrictions at the business-unit level may be too restrictive

to the extent diversification benefits or offsetting positions across business units are not taken into account. Risk limits that are often imposed include the following.

Risk budgeting refers to a risk management process that first determines the acceptable total risk for an organization, and then allocates that risk to different activities, strategies, or asset classes as appropriate. An example would be first determining the maximum allowable 5% VaR amount, then allocating that VaR across various business units. A portfolio manager may set a limit for total risk relative to a benchmark and then allocate that risk to deviations from the portfolio's target asset allocations, deviations from benchmark weights in specific industries, and deviations from benchmark weights for firms within a specific industry.

Position limits are one way to limit risk because they ensure some minimum level of diversification by limiting risk exposures. For example, position limits may be imposed on allocations to individual securities within an asset class, asset classes such as equities or high-yield bonds, investments in a single country, securities in a single currency or the differences between long and short positions for a hedge fund manager.

Position limits can be expressed as currency amounts or as percentages of a portfolio's value. Position limits can also be based on a liquidity measure, such as average daily or weekly trading volume.

Scenario limits are limits on expected loss for a given scenario.

Stop-loss limits require that a risk exposure be reduced if losses exceed a specified amount over a certain period of time. An example of a simple stop-loss limit is a requirement to reduce the portfolio allocation to a stock or asset class (by a given amount) if it declines in value by more than a specified percentage (or currency amount). A slightly more complex type of stop-loss limit is a requirement that a risk exposure be hedged as the value of a security or index falls. This is referred to as **portfolio insurance** when the value of a portfolio is hedged by index puts.

LOS 37.k: Explain how risk measures may be used in capital allocation decisions.

Capital allocation decisions refer to how the capital of a firm is used to fund its various business units or activities, analogous to asset allocation for a portfolio manager. The optimal capital allocation, ignoring risk, would be the allocation that maximizes the expected return on the firm's invested capital. Risk management, however, requires that the risk exposure for each use of firm capital be considered.

One way to introduce risk exposures to various activities into the capital allocation decision is to limit the overall risk of all the activities. By calculating a VaR for each activity or business unit, the maximum acceptable VaR can be allocated across the activities or business units in a process similar to risk budgeting for a portfolio manager. This is but one method of considering risk exposures when determining the optimal allocation of firm capital to various activities.



MODULE QUIZ 37.5

1. The risk committee of an investment management firm believes high-yield bonds will decrease in value if the economy goes into recession, and the committee decides to limit exposure to this asset class to 10% of assets under management. This constraint is *best* described as a:
 - A. position limit.
 - B. scenario limit.
 - C. stop-loss limit.

KEY CONCEPTS

LOS 37.a

Value at risk (VaR) is an estimate of the minimum loss that will occur with a given probability over a specified period expressed as a currency amount or as percentage of portfolio value.

LOS 37.b

Value at risk estimation methods:

- Parametric method—uses the estimated variances and covariances of portfolio securities to estimate the distribution of possible portfolio values, often assuming a normal distribution.
- Historical simulation—uses historical values for risk factors over some prior lookback period to get a distribution of possible values.
- Monte Carlo simulation—draws each risk factor change from an assumed distribution and calculates portfolio values based on a set of changes in risk factors; repeated thousands of times to get a distribution of possible portfolio values.

LOS 37.c

The x% VaR is calculated as the minimum loss for the current portfolio, x% of the time, based on an estimated distribution of portfolio values.

LOS 37.d

Advantages of VaR:

- Widely accepted by regulators.
- Simple to understand.
- Expresses risk as a single number.
- Useful for comparing the risk of portfolios, portfolio components, and business units.

Disadvantages of VaR:

- Subjective in that the time period and the probability are chosen by the user.
- Very sensitive to the estimation method and assumptions employed by the user.
- Focused only on left-tail outcomes.
- Vulnerable to misspecification by the user.

LOS 37.e

Conditional VaR (CVaR) is the expected loss given that the loss exceeds the VaR.

Incremental VaR (IVaR) is the estimated change in VaR from a specific change in the size of a portfolio position.

Marginal VaR (MVar) is the estimate of the change in VaR for a small change in a portfolio position and is used as an estimate of the position's contribution to overall VaR.

Ex ante tracking error, also referred to as relative VaR, measures the VaR of the difference between the return on a portfolio and the return on the manager's benchmark portfolio.

LOS 37.f

Sensitivity analysis is used to estimate the change in a security or portfolio value to an incremental change in a risk factor.

Scenario analysis refers to estimation of the effect on portfolio value of a specific set of changes in relevant risk factors.

A scenario of changes in risk factors can be historical, based on a past set of risk factors changes that actually occurred, or hypothetical (based on a selected set of significant changes in the risk factors of interest).

LOS 37.g

Equity risk is measured by beta (sensitivity to overall market returns).

The interest rate risk of fixed-income securities is measured by duration (sensitivity to change in yield) and convexity (second-order effect, change in duration).

Options risk is measured by delta (sensitivity to asset price changes), gamma (second-order effect, change in delta), and vega (sensitivity to asset price volatility).

Market risk can be managed by adjusting portfolio holdings to control the exposures to these various risk factors.

LOS 37.h

A stress test based on either sensitivity or scenario analysis uses extreme changes to examine the expected effects on a portfolio or organization, often to determine the effects on a firm's equity or solvency. A reverse stress test is designed to identify scenarios that would result in business failure.

Sensitivity analysis can give a risk manager a more complete view of the vulnerability of a portfolio to a variety of risk factors. Sensitivity and scenario risk measures provide additional information about portfolio risk but do not necessarily provide probabilities or, in the case of sensitivity measures, the sizes of expected changes in risk factors and portfolio value.

Sensitivity and scenario analysis provide information that VaR does not and are not necessarily based on historical results. A historical scenario will not necessarily be repeated. Hypothetical scenarios may be misspecified, and the probability that a scenario will occur is unknown.

LOS 37.i

VaR, sensitivity analysis, and scenario analysis complement each other, and a risk manager should not rely on only one of these measures.

- VaR provides a probability of loss.
- Sensitivity analysis provides estimates of the relative exposures to different risk factors, but does not provide estimates of the probability of any specific movement in risk factors.
- Scenario analysis provides information about exposure to simultaneous changes in several risk factors or changes in risk correlations, but there is no probability associated with a specific scenario.

LOS 37.j

Risk budgeting begins with determination of an acceptable amount of risk and then allocates this risk among investment positions to generate maximum returns for the risk taken.

Position limits are maximum currency amounts or portfolio percentages allowed for individual securities, securities of a single issuer, or classes of securities, based on their risk factor exposures.

A stop-loss limit requires that an investment position be reduced (by sale or hedging) or closed out when losses exceed a given amount over a specified time period.

A scenario limit requires adjustment of the portfolio so that the expected loss from a given scenario will not exceed a specified amount.

LOS 37.k

Firms use risk measures by adjusting expected returns for risk when making capital allocation decisions.

LOS 37.l

Banks are concerned with many risks including asset-liability mismatches, market risk for their investment portfolio, their leverage, the duration and convexity of their portfolio of fixed-income securities, and the overall risk to their economic capital.

Asset managers are most concerned with returns volatility and the probability distribution of either absolute losses or losses relative to a benchmark portfolio.

Pension fund managers are concerned with any mismatch between assets and liabilities as well as with the volatility of the surplus (assets minus liabilities).

P&C companies are concerned with the sensitivity of their investment portfolio to risk factors, the VaR of their economic capital, and scenarios that incorporate both market and insurance risks as stress tests of the firm.

Life insurers are concerned with market risks to their investment portfolio assets and liabilities (to make annuity payments), any mismatch between assets and liabilities, and scenarios that would lead to large decreases in their surplus.

Module Quiz 37.1

1. **C** Weekly 5% VaR of £1 million indicates that there is a 5% probability that a loss during any given week will be greater than £1 million. (LOS 37.a)
2. **C** Monte Carlo simulation uses estimated statistical properties for each of its risk factors. The parametric method and historical simulation both use a lookback period. (LOS 37.b)
3. **C** $\% \text{ VaR} = [0.065 - 1.65(0.09)] \times (-1) = 0.0835$
 $\$ \text{ VaR} = (0.0835) \times (\$6,400,000) = \$534,400$
(LOS 37.c)

Module Quiz 37.2

1. **A** Because VaR focuses on negative (left-tail) outcomes, it does not provide a complete view of the trade-off between risk and return. Advantages of VaR include its acceptance by global banking regulators and its usefulness in comparing risk across different asset classes. (LOS 37.d)
2. **B** Conditional VaR is the expected amount of a loss, given that it is equal to or greater than the VaR. Marginal VaR is the slope of a curve of VaR as a function of a security's weight in a portfolio. Incremental VaR is the change in VaR resulting from changing the portfolio weight of a security. (LOS 37.e)
3. **B** Vega is a measure of the sensitivity of an option value to changes in volatility of the underlying asset price. (LOS 37.f)

Module Quiz 37.3, 37.4

1. **A** Active share is the difference between the weight of a security in an asset manager's portfolio and its weight in a benchmark index. Maximum drawdown is a risk measure often used by hedge funds. Surplus at risk is a risk measure used by defined benefit pension plans. (Module 37.4, LOS 37.l)
2. **B** Pension fund managers are concerned with any mismatch between assets and liabilities as well as with the volatility of the surplus (assets minus liabilities). (Module 37.4, LOS 37.l)

Module Quiz 37.5

1. **A** Limiting the allocation to an asset class is an example of a position limit. (LOS 37.j)

READING 38

BACKTESTING AND SIMULATION

EXAM FOCUS

Understand how backtesting is part of risk assessment of an investment strategy, as well as the steps and procedures in backtesting a strategy. Be able to interpret the metrics and visuals reported in a backtest of an investment strategy and to identify problems in backtesting. In a historical scenario analysis, contrast Monte Carlo and historical simulation approaches. Understand the role of inputs and various choices made in crafting a simulation, and the process for interpreting a simulation. Finally, we'll demonstrate the use of sensitivity analysis as a complementary risk assessment technique.

MODULE 38.1: INTRODUCTION TO BACKTESTING

This reading offers a summary of backtesting and other methods of assessing the risk of investment strategies. Backtesting allows investment professionals to use historical data to simulate the performance of strategies, and to analyze the risk and return properties of these strategies, prior to making any actual investment.

Increases in the availability of data along with dramatic increases in computing power have facilitated quantitative assessments. Today, widely available software allows an investor to backtest and simulate infinite combinations of possible investment strategies, create multifactor models, and build investment portfolios, all before making any actual investment.

Objectives of Backtesting

LOS 38.a: Describe objectives in backtesting an investment strategy.

Backtesting is a process by which we use actual historical data to emulate the investment process, in order to determine whether a particular investment strategy or technique would have delivered the expected excess returns.

The primary goal of backtesting is to assess the risk and return of an investment strategy by simulating the investment process. This practice helps to reassure investors that investing strategies and models are likely to perform well.

Additionally, backtesting helps investors to refine and improve their investment process.

Backtesting has been extensively used in the financial industry for decades. While backtesting is a natural fit for systematic and quantitative investment styles, fundamental managers also make extensive use of backtesting.

The backtesting process is intuitive, because it mimics how investing is accomplished in reality: we formulate investment strategies, test those ideas using historical information, and then assess how well those strategies would have performed.

Backtesting relies on the assumption that the future will, at least to some degree, look like history and thus that a strategy that performs well in backtesting should perform well in real life. For various reasons that we will explore later, this is often not the case: methodologies that perform well in a backtest sometimes fail to deliver outperformance in actual use. (Conversely, a model that would have performed well in reality but that doesn't exhibit predictive power in backtesting will probably never be implemented.)



MODULE QUIZ 38.1

1. The primary objective of backtesting an investment strategy is to help an investor:
 - A. understand an investment strategy's risk–return trade-off.
 - B. generate the highest possible income without losing any principal.
 - C. develop portfolios that emphasize capital appreciation.
2. Backtesting helps us understand the risk–return tradeoff of an investment strategy by:
 - A. approximating the real-life investment process.
 - B. comparing the performance of the strategy to that of a previous strategy.
 - C. copying or duplicating an existing strategy.

MODULE 38.2: BACKTESTING AN INVESTMENT STRATEGY

LOS 38.b: Describe and contrast steps and procedures in backtesting an investment strategy.

The fundamental steps in backtesting an investment strategy are generally as follows:

1. Strategy design
2. Historical investment simulation
3. Analysis of backtesting output

Step 1: Strategy Design

The first step in backtesting is to determine our assumptions and investment objectives. For an active investor, our goal is generally to achieve high risk-adjusted returns, while managing downside risk. Other factors may also need to be considered, such as turnover, concentration, and our time horizon.

Investment Universe

The term **investment universe** is a reference to all the assets in which we might conceivably take a position while executing our strategy. For exposition, we will use the Russell 3000 Index, a broad U.S. equity index, as our investment universe.

Definition of Return

If our investment universe extends beyond our own country's borders, a number of complications emerge, for example: whether to denominate return in the local currency of the investment, or to translate returns into a single currency (often this decision will depend on whether or not our investments are currency hedged).

Returns also should be reported relative to a particular benchmark. Typically, the benchmark will be an index that reflects the investment universe of our strategy, such as the S&P/TSX Composite Index if our investment universe is the Canadian equity market.

Rebalancing Frequency and Transaction Cost

Monthly **rebalancing** is typical for investment portfolios, though shorter or longer frequencies are not uncommon. When higher-frequency rebalancing is used, transaction costs will increase and can become significant. It is important to consider these transaction costs because many apparent profit opportunities vanish once trading costs are considered. For this reason, performance presentation of a backtest should specify whether or not transaction costs are included.

Start Date and End Date

Portfolio managers generally prefer to use a long data history when backtesting strategies, in order to maximize confidence in the results. However, financial market data tends to be nonstationary, in that it is likely to contain various distinct regimes (a regime is a period of similar macroeconomic conditions—for example, recessions, expansions, or periods of high or low inflation). For this reason, the discrete time intervals within the history should additionally be individually analyzed.

Constructing Portfolios From Factor Portfolios

Equity investment strategies will typically employ factor-based models. Factors can be thought of as any variable that can be used to predict future returns or risks and thereby categorize stocks in terms of desirability. Factors are intended to represent unique sources of risk based on some economic fundamental. The goal of factor-based strategies is to identify signals that will allow us to assemble portfolios that will outperform the overall market. Active investment strategies can often be replicated by factors.

Aside from statistical measures, we also want to consider whether a particular factor makes instinctive sense: Is there theoretical support for the factor? Does it make sense from a financial perspective? We use these criteria to try to avoid the **data-mining trap**, which occurs when many different factors are considered, and those that perform well in a backtest are incorporated into the strategy—even if they don't have any logical or economic reason to be included. If a factor can successfully pass backtesting, but does not make logical sense, we may want to reject the factor: positive backtesting results alone don't ensure that future returns will be similar.

Normally, an investor will first develop a theory—for example, that stocks with a high income yield should produce higher returns going forward—and then based on this theory, formulate appropriate investing rules and procedures. After gathering the historical data for each stock (in this case, the earnings yield and return for each security), the investor will partition the data into two subsamples: training (in-sample) data, and testing (out-of-sample) data.

It would be unusual for an investor to rely on a single variable to guide their investment models. Rather, it is more common to construct a stock selection model that linearly combines several factors. Stock screening models will similarly take multiple factors into account.

Two clear and straightforward ways to combine factor portfolios are: first, a **benchmark portfolio (BM)**, which weights factors equally, and second, a **risk parity portfolio (RP)**, which combines factors so that each factor *contributes equally to risk*.

Investment Styles and Common Factors

For the purpose of exposition, we select several basic variables from each of the following common investment styles:

1. Defensive value:

- Based on trailing earnings yield.
- High E/P stocks are preferred.

2. Cyclical value:

- Based on book-to-market ratio.
- High ratio (low market value relative to book value) is preferred.

3. Growth:

- Based on consensus earnings growth for the coming year.
- Stocks with high earnings growth are preferred.

4. Price momentum:

- Based on 12-month total return, excluding the previous month.
- Stocks with momentum are preferred.

5. Analyst sentiment:

- Based on EPS changes over the past 3 months.
- Stock with positive earnings revisions is preferred.

6. Profitability:

- Based on return on equity.
- High ROE companies are preferred.

7. Leverage:

- Based on the debt/equity ratio.
- Stocks with low leverage are preferred.

8. Earnings quality:

- Based on level of accruals.

- Non-cash earnings are seen as low quality; stocks with low levels of accruals are preferred.

Suppose that we form a portfolio by shorting the “worst” 20% of stocks in the universe according to a particular factor, and buying the “best” 20% of stocks as measured by that factor. Rebalancing for each factor portfolio is performed monthly. We will not explicitly consider trading costs.

The most obvious method of combining these factors is with an equally weighted portfolio, which we will call the benchmark portfolio (BM). This kind of equally-weighted portfolio has been found to perform similarly to portfolios that use more-complex weighting schemes.

An alternative scheme for constructing portfolios is the risk parity (RP) portfolio construction technique, which accounts for the volatility of each factor and the correlations of returns among all the factors to be combined in the portfolio. Under the risk parity technique, each factor will make an *equal contribution to overall portfolio risk*.

Step 2: Historical Investment Simulation

In this step, we create the portfolio to be evaluated and then rebalance according to our predetermined frequency.

The actual construction of the portfolio will be guided by the investment strategy that we are pursuing, as well as any kind of constraints (such as geography, size, liquidity, limits on shorting, etc.).

Rolling Window Backtesting

Portfolio managers use backtesting to evaluate (for example) the viability of a factor.

In the **rolling window backtesting** approach, the investor will use a walk-forward (rolling window) system rather than dividing the data into just two samples. In this methodology, the investor will calibrate the trade signals or factors based on the moving window, adjust the model and rebalance the portfolio after each period as new information arrives, and then track performance over the long term. In this way, backtesting simulates real investing. Although the model parameters are continually tuned over time, the primary model methodology is fixed in advance (to avoid overfitting).

To illustrate this process, we will provide an example of backtesting the trailing 12-month earnings yield (i.e., value) factor. Suppose that we begin our backtesting on 30 November 2023. First, we calculate each stock’s trailing earning yield, by taking the earnings per share over the past 12 months (from December 2022 to November 2023), divided by the 30 November 2023 stock price. Based on this calculation, we will implement our methodology—which in this instance means shorting the lowest quintile of stocks (the 20% of firms with the lowest income yield), while purchasing the 20% of stocks with the highest earnings yield. We then measure the performance of our model versus the first out-of-sample (OOS) period, which is the following month, December 2023.

We then advance one month in time and repeat the process as of 31 December 2023, and one piece of out-of-sample data (December 2023) becomes in-sample data. We

continue until we have covered the entire timespan from November 2023 to April 2024. Using all of this data, we can then calculate performance of our strategy over the period, including monthly average return, maximum drawdown, volatility, and Sharpe ratio.

Our strategy will be accepted if it performs well in the out-of-test periods (and makes logical sense).

One caveat in using rolling window backtesting to assess investment strategies is that this methodology implicitly assumes that the same pattern of past performance is expected to repeat over time. Another caveat is that rolling window backtesting results may not reflect the dynamic nature of financial markets and possible extreme downside risk.

Backtesting the Performance of Factor Allocation Strategies

Backtesting a multifactor strategy is somewhat complex because we need to execute the rolling window process twice. First, we construct the eight factor portfolios using the walk-forward approach. (Each of these factor portfolios is long-short.) Then, we use either the benchmark (BM) or risk parity (RP) weighting schemes to form a multifactor portfolio. Then, a second rolling window process is used to determine the covariances and create the RP portfolio. Both the BM and RP portfolios (which are long-only in terms of the factor portfolios) are rebalanced monthly to maintain risk parity or equal weighting, as appropriate. These portfolios are then analyzed using out-of-sample data to determine the returns of each portfolio.

Step 3: Analysis of Backtesting Output

Long/Short Hedged Portfolio Approach

The conventional approach to employing factor-based portfolios is the Fama and French (1993) hedged portfolio methodology. In this approach, we first select a factor and then rank our stock universe by that factor. Then, we rank our universe of stocks based on factor scores, divide this universe into quantiles (and in this case, quintiles, meaning five equal layers based on our factor) and invest in each quintile based on the particular weighting scheme. (Inside each quintile, we may weigh the stock either equally or by market capitalization.) We then go long the top quintile (i.e., the stocks with the highest factor scores) and short the bottom quintile (i.e., the stocks with the lowest factor scores) in order to form a long/short hedged portfolio. (Note that one drawback of the long/short hedged portfolio approach is that some managers cannot short stocks.)

Rolling window backtesting can then be applied, with the portfolio being rebalanced monthly. This generates a series of out-of-sample performance data that we can then analyze using metrics such as the Sharpe ratio, maximum drawdown, Sortino ratio, et cetera.

Comparing the Results of Backtesting Methodologies

Testing can show that different backtesting methods will produce results that are somewhat different—or sometimes even completely different.

For example, if there is a non-linear relationship between a factor and future stock returns, one metric may suggest significant results, while another may not.

No perfect formula exists for determining which methodology to employ. Ideally, multiple methods will suggest similar results.



MODULE QUIZ 38.2

1. Considering the various factors (or assets) to be combined in an investment portfolio, the “risk parity” portfolio construction technique is *least likely* to take into account each factor’s (or asset’s):
 - A. volatility.
 - B. correlations.
 - C. liquidity.
2. The basic steps in a “rolling window” backtest are *most likely* to include:
 - A. making the prediction, computing the variance of the prediction error, and determining the prediction interval.
 - B. determining the position of the initial random centroids, assigning each observation to its closest cluster, and redefining the clusters.
 - C. strategy design, historical investment simulation, and analysis of backtesting output.
3. In the rolling window backtesting methodology, researchers are *least likely* to:
 - A. use a walk-forward framework.
 - B. calibrate trade signals based on the rolling window.
 - C. identify data, attributes, and priorities.

MODULE 38.3: METRICS, VISUALS, AND PROBLEMS IN BACKTESTING

LOS 38.c: Interpret metrics and visuals reported in a backtest of an investment strategy.

Metrics

In addition to the familiar Sharpe ratio and the Sortino ratio (which uses target semideviation rather than standard deviation), a number of other measures are commonly used to quantify investment performance.

Value at Risk

A portfolio’s **value at risk (VaR)** is one way to quantify the amount of risk present in the left tail of a portfolio’s return distribution. VaR is a measure of the minimum amount of value losses expected for a given period of time at a particular level of probability. Unfortunately, VaR is sensitive to our assumptions about the shape of the distribution (for example, fat tails versus normal tails).

Conditional VaR

Conditional VaR (CVaR) is an extension of VaR that provides a more comprehensive measure of tail loss than VaR does. CVaR quantifies the weighted average of all returns that exceed the specified value of loss. As an example, if we select a significance level of $\alpha = 5\%$, the CVaR is the expected value of the return

within that lowest 5% of outcomes. If we have a series of historical returns, CVaR is calculated as the average loss once the VaR cutoff is exceeded.

Maximum Drawdown

Maximum drawdown is a commonly used measure of downside risk; it represents the greatest amount of loss that an asset has experienced from peak to trough in the past. Maximum drawdown as a risk measure is based on the idea that the best indication of downside risk is actual past loss events. To calculate maximum drawdown, we begin with the asset's maximum cumulative return, and then subtract from the lowest cumulative return that occurs after that point. Commodity trading advisors (CTAs) and hedge funds often use maximum drawdown.

Visuals

When evaluating an investment strategy, it can be useful to examine the long-term cumulative return performance of an investment strategy by plotting it using a logarithmic scale. This makes equivalent percentage changes span the same vertical distance on the y-axis. By examining such a graph, we can often immediately recognize structural breaks and performance decay, and also evaluate downside risk.

Distribution plots of factor returns are an example of a visual often used in assessing the backtesting of a factor-based investment strategy.

LOS 38.d: Identify problems in a backtest of an investment strategy.

Problems in Strategy Backtesting

There are several errors that quantitative investors commonly make when backtesting that are likely to introduce behavioral biases or other issues.

Survivorship Bias

Survivorship bias occurs when, at a particular point in time, we consider only those firms or stocks that have remained in existence (i.e., survived) to that time. Survivorship bias is arguably the most well-known and yet also the most common error that investors make in backtesting. Despite this issue being familiar to academics and practitioners alike, investors across many kinds of assets will fail to account for the impact of survivorship bias.

Survivorship bias comes about because identifying all securities that exist at the moment is straightforward, while identifying all securities that have existed since a particular point in time (including those that are now defunct) can be much more difficult. The desired solution to this issue is to use **point-in-time data**, which represents the specific data that was available at a particular point in history. Point-in-time data takes into account what is not known at a given point in time, and thus allows investors to avoid look-ahead bias and survivorship bias, in order to implement the most realistic backtesting of an investment strategy.

Stocks and firms emerge and vanish continuously. A company can disappear (and be removed from an index) for a number of reasons: perhaps it was taken private, went bankrupt, was acquired, or simply delisted from an exchange for poor performance.

New firms also appear and are added to the major indexes through various mechanisms including successful startups, as well as corporate actions like carve-outs or spin-offs.

As an example, the US Russell 3000 Index has contained approximately 3,000 securities since it was initiated at the end of 1985, and it still contains 3,000 securities more than 35 years later. However, of the original 3,000 stocks, less than 400 (approximately 13%) were still in the index as of May 31, 2019.

Backtesting using only stocks that have endured through time can introduce significant bias and can even produce results that are the opposite to the correct conclusion.

Unfortunately, keeping track of hundreds of securities over long periods is not simple, so investors may resort to backtesting using only the securities that exist today. The flaw in this methodology is that we cannot be certain which securities will survive in the future.

One example that we might consider when analyzing survivorship bias would be the low-instability anomaly, which suggests that over the long term, low-volatility stocks will generally outperform high-volatility stocks. If we correctly use point-in-time data, we would conclude that low-volatility stocks do indeed outperform high-volatility stocks from 1989 through 2019. However, if we base our analysis only on those stocks that exist today, without considering the stocks that have disappeared over the decades, we will come to the opposite conclusion. This result is perhaps not surprising: a historically high-volatility stock that has survived to the present day likely outperformed other stocks during that time.

This case demonstrates the importance of using point-in-time data in backtesting, rather than only using existing/surviving stocks.

Look-Ahead Bias

Look-ahead bias is another common error that investors make when backtesting an investment strategy. This problem arises when an investor makes use of data that would not have been available at the time an investment decision is made. (Survivorship bias is arguably a special case of look-ahead bias, because survivorship bias stems from only including securities that will still exist in the future.) Look-ahead can come about due to **reporting lag**, which refers to a situation where data describing a period is often available only *after* the period ends (and is often subject to revision).

In backtesting we should ideally use only point-in-time information. However, not all data vendors provide point-in-time data, so we may need to make some adjustments to account for look-ahead bias. We might adjust the data by adding a lag assumption of one, two, or three months. For instance, if a firm's financial quarter ends on December 31, 2023, we should not expect to have that company's results on that date. Many large-capitalization firms report earnings within 30 to 50 days of quarter end, while a small or midsize company might take even more time.

Our first approach would be to make some assumptions about reporting lag. If we make the assumption that earnings data for all companies is available a month later on January 31, 2024, we would encounter look-ahead bias with firms that took

longer than a month to report earnings. Conversely, if we used a three-month lag and assumed that earnings were available on March 31, 2024, we would be introducing the problem of stale data into our analysis, and our backtest would be overly conservative. Again, using point-in-time data is preferable to having to make these kinds of assumptions and adjustments.

A related issue occurs when accounting errors, or changes in accounting standards, causes firms to re-state their past financial statements. Similarly, government agencies frequently revise macroeconomic data. Vendors' data may reflect the current or corrected data or figures, which can be different from the information originally available to the market—meaning that a different decision may have been made based on the data available at that time.

Data Snooping

Suppose that an investment analyst tries many different models, backtests each of them, and then selects the one with the highest numerical results. The practice of backtesting numerous strategies and then selecting the best-performing one—rather than constructing a portfolio based on sound theory—is problematic because it is likely to result in false-positive results. This process of performing analyses until we “find” a statistically significant strategy is called **data snooping** (or, sometimes, “p-hacking”). Data snooping can come in various forms. A portfolio manager should be wary of strategies that may have been developed using data snooping to select the model with the highest t-statistic and lowest p-value.

One solution to data snooping is to use a higher-than-normal critical t-statistic (e.g., 3.0) as a benchmark for declaring a variable to be significant (i.e., for concluding that it adds value to the model).

Another method to deal with data snooping is to use **cross-validation**, a technique that involves testing a hypothesis on a different set of data than the one that was initially used to form the inference or test the hypothesis. To perform cross-validation, we divide our data into “training data” versus “validation data” (i.e., testing data). Rolling-window backtesting is actually a type of cross-validation, without the random component: in-sample periods (i.e., past periods) are used to tune a model, which is then applied to data from out-of-sample (i.e., later) periods.



MODULE QUIZ 38.3

1. In assessing backtesting results, an analyst is *least likely* to take into account:
 - A. traditional performance measurements such as Sharpe ratio and Sortino ratio.
 - B. value at risk, conditional value-at-risk, and maximum drawdown.
 - C. transcription perturbations, synthesis, codon optimality, and translation elongation.
2. Issues in backtesting to which analysts should pay particular attention are *least likely* to include:
 - A. survivorship bias.
 - B. look-ahead bias.
 - C. hindsight bias.

MODULE 38.4: SCENARIO ANALYSIS AND SENSITIVITY ANALYSIS

Historical Scenario Analysis

Historical scenario analysis (also known as historical stress testing) is a form of backtesting where we investigate the risk and return of an investment strategy during various regimes, while taking into consideration the various structural breaks that are present.

Two typical examples of regime changes are when volatility changes, or when the economy switches from downturn to expansion, as described here:

1. **Recession versus expansions.** It is normal for an economy to occasionally enter periods of economic decline; one relatively recent example is the "Great Recession" that followed the global financial crisis of 2007 and lasted until 2009. One point to note is that the beginning and end of such a downturn are defined retroactively; it is common for the beginning or end of a recession to not be formally identified by economic research organizations until a year or more later.
2. **Low- and high-volatility periods.** We might define a high-volatility period as one where the VIX is above its five-year moving average, versus a low-volatility period where the VIX is below its five-year moving average. (The VIX index was created by the Chicago Board Options Exchange [CBOE] to measure the volatility implied by the prices of options on the S&P 500 Index.)

Many other situations lend themselves to scenario analysis; for example, we might simulate the performance and risk of investment strategies in both "trade agreement" and "no-trade-agreement" environments.

The motivation for considering various regimes is that the risk and return of various strategies tends to vary depending on the regime. For example, thinking about the risk parity factor portfolio we considered earlier in terms of Sharpe ratios, the RP strategy is likely to be more resilient in a recession compared with the BM strategy. Furthermore, the RP strategy is likely to perform well in both a low-volatility or high-volatility regime, while the BM strategy may not perform well in a low-volatility environment.

We can also use a *probability density plot* to further explore performance in various regimes. For example, return distribution for the BM and RP strategies has been found to be more dispersed in an expansionary environment than in a recessionary environment. We can also evaluate non-normality, for example, the BM strategy exhibits negative skewness and fat tails in both an expansion and a recession, though with a lower average return in a recessionary environment. (The RP strategy performs similarly, though with lower kurtosis and volatility.)

Simulation Approaches

Asset allocation strategies are based on the general idea that the future will somewhat resemble the past.

However, another major assumption is that asset returns will take the shape of a multivariate normal distribution. In reality, return distributions frequently exhibit negative skewness and excess kurtosis (i.e., fat tails). Excess kurtosis indicates that a strategy is more likely to generate extreme returns (i.e., surprises), while negative skewness warns that these surprises are more likely to be negative than positive. Both of these characteristics are considered undesirable by risk-averse investors.

For this reason, conventional asset allocation methods that use covariance (e.g., mean-variance optimization) may at times yield misleading outcomes. Furthermore, rolling-window backtesting can only take into consideration things that have already happened in the recorded past, and it thus may not accurately characterize potential downside risks that result from changes in the financial markets or other unforeseen events.

For these reasons, we supplement our rolling-window backtesting with (1) scenario analysis and (2) simulation.

Simulation Analysis

Backtesting is based on the concept of going back to the past, implementing our investing strategy, maintaining the portfolio over time according to a set of predetermined rules, and then evaluating the resulting performance. This process has a number of benefits—for example, it is easy to understand. However, we are implicitly assuming that history will repeat itself. With ever-changing financial markets, this is often not a valid assumption: never-before-seen risks and opportunities occasionally arise.

Consider two primary classes of simulation: historical simulation and Monte Carlo simulation.

In a **historical simulation**, we select past returns at random from a long historical period, without regard to the order of occurrence. In an asset management application, this means that we randomly sample (with replacement) from the past record of asset returns, where each set of past monthly returns is equally likely to be selected. This methodology is similar to rolling-window backtesting, except that we abandon the time sequence in which the returns actually occurred. Financial institutions, and in particular banks, make extensive use of historical simulation to evaluate risk.

A downside of historical simulation is that we only have actual past data to draw from, and the past only occurred in one particular way. **Monte Carlo simulation** overcomes this issue by assigning a statistical distribution to each relevant variable, and then drawing random observations from this distribution. Monte Carlo simulation randomly samples from an assumed multivariate joint probability distribution, and the parameters of the multivariate distribution are calibrated using the past record of asset returns. The Monte Carlo approach is very flexible, allowing a variety of distributions. In this way, we can allow actual characteristic such as non-normality, tail dependence, fat tails, et cetera in our key variables, rather than forcing a normal distribution to the data or limiting ourselves to actual historical results.

One possible downside of Monte Carlo simulation is its complexity, which necessitates significant computing power. A particularly useful application of

simulation is to try to evaluate an investment strategy's downside risk. Simulation can also help us to validate the results of backtesting.

Steps typically used to perform a simulation analysis are as follows:

1. **Select the target variable that we want to analyze.** Usually, we are trying to evaluate the return of a particular strategy, as well as its return distribution.
2. **Determine the key decision variables.** These include the returns of the underlying assets, and the portfolio weights of each asset as indicated by the strategy.
3. **Select the number of simulation trials ("N") to run.** Choosing an optimal number of trials is complex; however, a number in the range of 1,000 to 10,000 is typically used. Generally, the greater the number of trials, the more stable the results will be.
4. **Specify a distribution for each key variable.** Here, historical simulation and Monte Carlo simulations differ. For a historical simulation, we randomly select samples from historical data. For Monte Carlo simulation, however, we instead choose an appropriate statistical distribution (e.g., normal, uniform, lognormal) for each key variable. We can also take tail dependence and correlations between variables into account.
5. **Draw "N" random numbers for each key variable.** A random number generator is used to select these values.
6. **Compute the values of the target variable.** Using the values of the key decision variables determined in the previous step, we calculate the corresponding value of the target variable (such as portfolio return). These results are compiled for use in the final step.
7. **Repeat random number draws and calculate target variable.** Steps 5 and 6 are repeated for "N" iterations.
8. **Calculate metrics.** Using the "N" simulated values of the target variable, we compute measures such as average return, variance, Sharpe ratio, etc. We can also calculate various downside risk metrics, such as maximum drawdown and CVaR.

LOS 38.g: Explain inputs and decisions in simulation and interpret a simulation.

Simulation Inputs and Decisions

Historical Simulation

Historical simulation shares some similarities with rolling-window backtesting; they both use the past to try to forecast the future. However, they differ in that historical simulation introduces a non-deterministic element: historical simulation selects random pieces of history, rather than simply using it chronologically.

Historical simulation can be performed with-or-without returning the samples for further selection. We use the term **bootstrapping** to refer to sampling with replacement; this technique is useful when the number of simulations is large relative to the size of the data set.



PROFESSOR'S NOTE

The term "bootstrapping" as applied here to simulations is entirely unrelated to the interest rate bootstrapping process we examined in Fixed Income.

Monte Carlo Simulation

Monte Carlo simulation has some commonalities with historical simulation. However, a significant downside of historical simulation is that the data is limited only to things that have actually happened in the past, which may not be a useful representation of the future. Monte Carlo simulation can overcome this issue: Monte Carlo simulation is a non-deterministic technique that does not use historical data directly.

The first step in Monte Carlo simulation is to select an appropriate distribution for each key decision variable. This step requires us to consider not only the mean and standard deviation of each variable but also other higher-order moments such as skewness and kurtosis, as well as **tail dependence**.

The tail dependence coefficient measures the correlation (i.e., co-movements) between the tails of two random variables. Two variables with a high tail dependence exhibit tail probabilities that increase and decrease together, and a plot of the joint distribution of returns for the two factors will show peaks in the tail. We are likely to underestimate downside risk if we fail to account for positive tail dependence.

Various analytical tools and techniques can be used to fit a distribution to each of the key decision variables. Model calibration is then performed using regression and distribution-fitting techniques to estimate the parameters (such as standard deviation, mean return, kurtosis, and skewness) underlying the statistical distributions of the key decision variables. Programming languages such Python, R, and Matlab can fit these variables with relative ease.

In order to produce useful results from a Monte Carlo simulation, it is vital that we select statistical distributions that correctly fit the historical data. Asset returns are often approximated by distributions such as the Student's t-distribution or the normal distribution. However, it is important to factor in any correlation that may be present between variables. When we are simulating multiple assets or factors that have returns that are correlated, it is critical to specify a multivariate distribution rather than modeling each asset on an individual basis. A multivariate distribution allows us to represent this correlation, unlike standalone modeling of each factor.

It is important to recognize the tradeoff between having too few parameters versus making a model too complex. A model that is highly complex is likely to describe the historical data well; however, it will contain many parameters that must be estimated using historical data. If the historical data is limited, our estimates of these parameters are likely to be imprecise, leading to large estimation errors (despite low specification errors). Conversely, a model with few parameters may not fit the data well (because it is misspecified), even though it has low estimation errors.

Interpreting Simulation Results

We use several measures to interpret the results of simulations:

- Sharpe ratio
- Downside risk measures
- CVaR

To interpret simulation results, it is useful to examine the difference between the simulated performance of the benchmark versus our portfolio.

Historical simulation and Monte Carlo simulation serve as useful complements to (and validation of) backtesting because they model randomness using different approaches and therefore provide us a richer analysis of performance.

Different approaches (i.e., backtesting, historical simulation, Monte Carlo simulation) are likely to produce different outcomes. Varying specification of parameter estimates, distribution characteristics, et cetera will produce varying estimates of the Sharpe ratio, CVaR, and downside risk.

LOS 38.h: Demonstrate the use of sensitivity analysis.

Sensitivity Analysis

Sensitivity analysis can be used to gain a better understanding of the risks and returns of an investment strategy. Specifically, sensitivity analysis helps us to understand how our target variable (typically portfolio return) varies due to changes in one of the various input variables.

The result of a Monte Carlo simulation depends heavily on whether we have accurately specified the distributions of underlying variables. In the presence of fat tails and skewness, the joint distribution of returns will rarely be multivariate normal, so means and variances of these returns and the correlations between them will be insufficient to describe the joint return distribution.

To quantify the risk of misspecification, we can conduct a sensitivity analysis by calibrating a different distribution to our factor return data and then running the simulation again.

The process for performing a sensitivity analysis is similar to the process described earlier for performing a Monte Carlo simulation; however, we fit the data to a multivariate skewed t-distribution rather than to a multivariate normal distribution. (The multivariate skewed t-distribution is similar to the multivariate normal distribution, but it allows for fat tails and skewness.)

After generating (for example) 1,000 simulations using this new distribution, we evaluate the strategy risk and return indicated by the results. We can then compare the results of backtesting and simulation, using measures such as Sharpe ratio or conditional VaR. We may find that the various simulation methods support each other, or that they paint different pictures of, for example, left-tail risk.



1. It would be *least accurate* to state that historical scenario analysis:
 - A. is an overall examination of the complete historical record of an asset's average past performance.
 - B. examines the efficacy of a strategy in discrete historical environments, such as during recessions or periods of high inflation.
 - C. can help investors understand the performance of an investment strategy in different structural regimes.
2. Standard rolling-window backtesting is *most likely* to fail to account for downside asset returns due to:
 - A. negative skewness, excess kurtosis, and tail dependence.
 - B. positive skewness, fat tails, and clustering of extreme events.
 - C. negative skewness, platykurtic distribution, and tail dependence.
3. Unlike historical simulation, under the Monte Carlo approach:
 - A. each key variable is assigned a statistical distribution.
 - B. repeated samples are drawn from a set of time-series data.
 - C. the data is assumed to be stationary.
4. In historical simulation, "bootstrapping" is *most accurately* described as:
 - A. random draws with replacement.
 - B. forming a company with little capital.
 - C. constructing a zero-coupon yield curve.
5. Compared to a conventional Monte Carlo simulation, the use of a multivariate skewed Student's *t*-distribution is *more likely* to:
 - A. account for skewness in the data set.
 - B. require the estimation of fewer parameters.
 - C. benefit from smaller estimation errors.

KEY CONCEPTS

LOS 38.a

The primary goal of backtesting is to assess the risk and return of an investment strategy by simulating the investment process.

Backtesting uses past data to evaluate whether a particular investment strategy would have produced excess returns historically. This assessment allows an investor to optimize their investment process and strategy.

LOS 38.b

The three steps in backtesting an investment strategy are:

1. Strategy design:
 - Specify the investment hypothesis and goals.
 - Determine the investment process and rules of the investment strategy.
 - Select key parameters.
2. Historical investment simulation:
 - For each period, assemble a portfolio according to the previously determined rules.
 - Rebalance the portfolio over time based on those investment rules.
3. Analysis of output:
 - Compute performance statistics, such as risk and return for the portfolio.

- Calculate other relevant metrics, such as turnover.

In rolling-window backtesting, an investor makes use of a walk-forward (rolling-window) process, calibrates or fits trade signals or factors based on this rolling window, periodically rebalances the portfolio, and then evaluates portfolio performance over time. In this way, rolling-window backtesting simulates real-world investing.

LOS 38.c

The backtest of an investment strategy will produce return metrics, such as average return, and risk measures, such as volatility and downside risk. Other measures that can be calculated include the Sharpe ratio, the Sortino ratio, and maximum drawdown (the maximum loss from a peak to a trough).

Visuals used in a backtest of an investment strategy often include return distribution plots.

LOS 38.d

Problems in a backtest of an investment strategy include the following:

- Survivorship bias—When using data that only includes entities that have persisted until today.
- Look-ahead bias—When using information that would have been unavailable at the time of the investment decision.
- Data snooping—When a model is chosen based on backtesting performance. (i.e., a large t-statistic or a small p-value).

Cross-validation is when a model is first fitted using training data, and then its performance is assessed (often over several rounds) using separate testing data. An investment strategy can also be cross-validated using data from different geographic regions: performance from other global markets can help determine whether a strategy is robust.

LOS 38.e

Scenario analysis is a method for investigating the performance and risk of investment strategies under different structural regimes (such as recession versus nonrecession, or high volatility versus low volatility). Stress testing examines the performance of a strategy under the most adverse combinations of events and scenarios.

If asset returns do not follow a multivariate normal distribution, scenario analysis and simulation can provide a more complete picture of investment strategy performance. Scenario analysis can be used to analyze the performance and risk of investment strategies in different structural regimes.

Asset return distributions often exhibit skewness and excess kurtosis (i.e., fat tails). Also, conventional rolling-window backtesting may not fully account for the dynamic nature of financial markets or possible extreme downside risk. Scenario analysis and simulation can provide a more thorough portrayal of investment strategy performance.

LOS 38.f

Monte Carlo and historical simulation approaches are methods used to account for skewness, excess kurtosis, and tail dependence.

In historical simulation, observations are randomly chosen from the historical dataset so that each observation has an equal probability of being selected.

Simulations (both historical and Monte Carlo) are nondeterministic and random.

In a Monte Carlo simulation, a statistical distribution is specified and calibrated using historical return data. When the assets or factors are correlated, a multivariate distribution should be used rather than modeling each asset or factor on a standalone basis.

LOS 38.g

Historical simulation is relatively simple and shares many of the advantages and disadvantages of rolling-window backtesting: both historical simulation and rolling-window backtesting depend on the assumption that randomness in the future can be predicted using return distributions from the past.

Historical simulation sometimes makes use of bootstrapping, whereby random samples are drawn *with* replacement. Bootstrapping is useful when the number of simulations needed is large relative to the size of (historical) dataset.

LOS 38.h

Sensitivity analysis is a method for evaluating how a target variable (such as portfolio return) varies due to changes in the input variables (such as asset or factor returns).

Sensitivity analysis can overcome the shortcomings of a traditional Monte Carlo simulation, because it is not limited to multivariate normal distributions (which do not take into account fat tails or negative skewness).

To conduct a sensitivity analysis, we fit factor return data to a distribution that accounts for skewness and excess kurtosis (e.g., a multivariate skewed Student's t-distribution), and then repeat the Monte Carlo simulation.

While use of a skewed multivariate t-distribution helps to take fat tails and skewness into account, this also increases the possibility of estimation error, because a multivariate skewed t-distribution requires estimates of more parameters.

ANSWER KEY FOR MODULE QUIZZES

Module Quiz 38.1

1. **A** Backtesting's main objective is to help us understand the risk–return trade-off of an investment strategy by simulating the real-life investment process. (LOS 38.a)
2. **A** Backtesting helps us understand the risk–return trade-off of an investment strategy by simulating the real-life investment process. (LOS 38.a)

Module Quiz 38.2

1. **C** Risk parity is a technique for portfolio construction that takes into account (1) the volatility of each factor (or asset), and (2) the correlations of returns between the factors (or assets) to be combined. The idea of risk parity is that each factor (or asset) should contribute an equal amount of risk to the portfolio (hence, "parity"). (LOS 38.b).
2. **C** The fundamental steps involved in rolling window backtesting are: (1) strategy design, (2) historical investment simulation, and (3) analysis of backtesting output.
3. **C** In the rolling window backtesting methodology, researchers use a walk-forward (also called rolling window) framework, fit/calibrate factors or trade signals based on the rolling window, periodically rebalance the portfolio, and then track performance over time. Rolling window backtesting is considered to be a proxy for actual investing. (LOS 38.b)

Module Quiz 38.3

1. **C** When evaluating the results of backtesting, analysts should take a range of performance measurements into account. Examples include the Sharpe ratio and Sortino ratio, as well as value at risk, conditional value-at-risk, and maximum drawdown. (LOS 38.c)
2. **C** Analysts should pay special attention to some particular behavioral issues in backtesting, including look-ahead bias and survivorship bias. (Hindsight bias, on the other hand, is a common cognitive bias sometimes called the "I knew it all along" phenomenon.) (LOS 38.d)

Module Quiz 38.4

1. **A** Historical scenario analysis is an examination of discrete regimes within a long history, such as periods of high and low inflation, recessions and expansions, et cetera. Scenario analysis can help investors understand the performance of an investment strategy under different structural regimes. Historical scenario analysis examines the efficacy of a strategy in discrete historical environments, such as during recessions or periods of high inflation. (LOS 38.e)
2. **A** Compared with normal distributions, asset and factor returns often exhibit negative skewness, fat tails (i.e., excess kurtosis), and tail dependence. For these reasons, rolling-window backtesting may fail to account fully for asset return randomness, especially in terms of downside risk. (LOS 38.f)
3. **A** In a Monte Carlo simulation, a statistical distribution is specified for each of the key variables, and random observations are then drawn from this assigned distribution. One problem with historical time-series data is that there is only one set of actual past data to draw from, because the past happened only one way. (LOS 38.f)
4. **A** Bootstrapping used in historical simulation refers to random draws with replacement. (LOS 38.g)
5. **A** Conventional Monte Carlo simulation assumes as a starting point a multivariate normal distribution. A multivariate skewed t-distribution takes

skewness and kurtosis into account but is likely to suffer from larger estimation errors due to the need to estimate more parameters. (LOS 38.h)

READING 39

ECONOMICS AND INVESTMENT MARKETS

EXAM FOCUS

This topic review links real rate of return to investors' inter-temporal rate of substitution. It further uses utility theory to derive risk premium for consumption hedging properties of assets. Be able to identify appropriate risk premiums for different asset classes.

MODULE 39.1: VALUATION AND INTEREST RATES



Video covering this content is available online.

LOS 39.a: Explain the notion that to affect market values, economic factors must affect one or more of the following: 1) default-free interest rates across maturities, 2) the timing and/or magnitude of expected cash flows, and 3) risk premiums.

The value of any asset can be computed as the present value of its expected future cash flows discounted at an appropriate risk-adjusted **discount rate**. The more uncertain the cash flows, the higher the discount rate.

Components of the discount rate are:

1. The real risk-free rate (R).
2. Expected inflation (π).
3. A risk premium reflecting uncertainty about the cash flow (RP).

The value of an asset will change if either the cash flow forecasts change or any of the components of the discount rate changes. Risk premiums not only vary across assets (and asset classes), but also vary with changes in investors' perception of risk. We will examine the decomposition of risk premiums for several asset classes in the remainder of this topic review.

LOS 39.b: Explain the role of expectations and changes in expectations in market valuation.

The value of an asset depends on (1) its expected future cash flows and (2) the discount rate used to value those cash flows. As market participants receive new information, the timing and amounts of expected future cash flows are revised and valuations change as a result. The impact of new information will depend on its effect on current expectations so that an earnings report of 53% growth in earnings may have a positive or negative effect on the firm's value, depending on whether expectations were for slower or more rapid growth.

LOS 39.c: Explain the relationship between the long-term growth rate of the economy, the volatility of the growth rate, and the average level of real short-term interest rates.

Even in a world of no inflation, a default-free bond has to compensate an investor for forgoing their current consumption. The investor evaluates the disutility of forgoing current consumption relative to the utility of obtaining future consumption.

The real risk-free rate of interest derives from the **inter-temporal rate of substitution**, which represents an investor's trade-off between real consumption now and real consumption in the future. Based on utility theory, we can represent this trade-off as:

inter-temporal rate of substitution =

$$\begin{aligned} m_t &= \frac{\text{marginal utility of consuming 1 unit in the future at time } t}{\text{marginal utility of current consumption of 1 unit}} \\ &= \frac{u_t}{u_0} \end{aligned}$$

For a given quantity of consumption, investors always prefer current consumption over future consumption ($u_0 > u_t$) and $m_t < 1$ as a result.

The current price (P_0) of a zero-coupon, inflation-indexed, risk-free bond that will pay \$1 at time 1 can be expressed as:

$$P_0 = E(m_1)$$

in which case, the real risk-free rate of return is:

$$R = \frac{1 - P_0}{P_0} = \left[\frac{1}{E(m_1)} \right] - 1$$



PROFESSOR'S NOTE

We have been considering an inflation-indexed bond in this example because we do not want to consider the effects of inflation in our analysis yet.

Some key points to keep in mind:

- The higher the utility investors attach for current consumption relative to future consumption, the higher the real rate.
- Diminishing marginal utility of wealth means that an investor's marginal utility of consumption declines as wealth increases. This suggests that marginal utility of

consumption is higher during periods of scarcity, such as during economic contractions.

- If investors expect higher incomes in the future, their expected marginal utility of future consumption is decreased relative to current consumption. When investor expectations about the economy change to better economic times ahead, the expectation of higher incomes in the future will lead to an increase in current consumption and a reduction in savings. Investors will derive greater utility from current consumption relative to future consumption and would, therefore, save less. Conversely, investors expecting worse times ahead would prefer to increase future consumption by reducing current consumption and saving more.
- Investors increase their savings rate when expected returns are high or when uncertainty about their future income increases.

Risky Cash Flows and Risk Premiums

The risk aversion of investors can be explained by the covariance of an investor's inter-temporal marginal rate of substitution and expected returns on savings. Our discussion so far was limited to risk-free investments. However, if the underlying cash flows are uncertain, investors demand a risk premium for bearing the risk that comes with such uncertainty. The investor's expected marginal utility of a payoff is inversely related to the level of uncertainty of the payoff. Investors experience a larger loss of utility for a loss in wealth as compared to a gain in utility for an equivalent gain in wealth. This property is called **risk aversion**.

An investor's absolute risk aversion declines with their wealth; wealthier investors are less risk-averse and more willing to take risk relative to their poorer counterparts. However, the marginal utility of holding risky assets declines as an investor holds more risky assets in her portfolio. When the markets are in equilibrium, wealthy and poorer investors would have the same willingness to hold risky assets.

Consider a risk-free, inflation-indexed, zero-coupon bond that an investor will sell prior to maturity. The uncertainty about the sale price gives rise to a risk premium. The price of the bond will be lower than the expected sale price discounted at the real risk free rate. We can model this risk premium as:

$$P_0 = \frac{E(P_1)}{(1+R)} + \text{cov}(P_1, m_1)$$

where:

R = the real risk-free rate

The covariance between the expected future price of the bond and the investor's inter-temporal rate of substitution can be viewed as a risk premium. Now imagine this relationship in the context of a risky asset (e.g., stocks). For risk-averse investors, the covariance is negative; when the expected future price of the asset is high, the marginal utility of future consumption relative to current consumption is low. This is because during good economic times, both investors' labor incomes and most risky asset values are high. However, with higher future labor incomes, the marginal utility of future consumption is lower. The resulting negative covariance between the marginal utility of consumption and asset prices reduces the value of the asset for a given expected sale price, P_1 . Everything else constant, the lower

current price (P_0) increases expected return. This higher expected return is due to a positive risk premium.

For a single-period risk-free bond, the covariance is zero as there is no uncertainty about the terminal value; there is no risk premium.

GDP Growth Rates

If GDP growth is forecasted to be high, the utility of consumption in the future (when incomes will be high) will be low and the inter-temporal rate of substitution will fall; investors will save less, increasing real interest rates. Therefore, real interest rates will be positively correlated with real GDP growth rates. This is consistent with the existence of high real rates in rapidly growing developing economies such as those of India and China. Interest rates are also positively correlated with the expected volatility in GDP growth due to higher risk premium.

LOS 39.d: Explain how the phase of the business cycle affects policy and short-term interest rates, the slope of the term structure of interest rates, and the relative performance of bonds of differing maturities.

So far we have not considered the implications of inflation in our analysis of the correlation between interest rates and GDP growth. Nominal risk-free interest rates include a premium for expected inflation (π). However, actual inflation is uncertain. This additional risk gives rise to an additional risk premium for the uncertainty about actual inflation (θ). This risk premium is higher for longer maturity bonds.

For short-term risk-free securities (e.g., T-bills), the uncertainty about inflation is negligible and, therefore, the nominal interest rate (r) would be comprised of real risk-free rate (R) and expected inflation (π):

$$r(\text{short-term}) = R + \pi$$

For longer term bonds, we add the risk premium for uncertainty about inflation, θ :

$$r(\text{long-term}) = R + \pi + \theta$$

Taylor Rule

Central banks are usually charged with setting policy rates so as to (1) maintain price stability and (2) achieve the maximum sustainable level of employment. The Taylor rule links the central bank's policy rate to economic conditions (employment level and inflation):

$$r = R_n + \pi + 0.5(\pi - \pi^*) + 0.5(y - y^*)$$

where:

r = central bank policy rate implied by the Taylor rule

R_n = neutral real policy interest rate

π = current inflation rate

π^* = central bank's target inflation rate

y = log of current level of output

y^* = log of central bank's target (sustainable) output

Central banks can moderate the business cycle by making appropriate changes to the policy rate or can magnify the cycle by not responding appropriately to

changing economic conditions (e.g., committing policy errors such as keeping rates too low).

Business Cycle and Slope of the Yield Curve

When the economy is in recession, policy rates tend to be low. Investors' improving expectations about future GDP growth and increasing inflation as the economy comes out of recession, leads to higher longer-term rates. This results in a positively sloped yield curve. Conversely, expectations of a decline in GDP growth results in a negatively sloped (inverted) yield curve. For this reason, an inverted yield curve is often considered a predictor of future recessions. Later stages of an economic expansion often are characterized by high inflation and high short-term interest rates, while longer term rates tend to be low, reflecting investor's expectation of decreasing inflation and GDP growth.

A **term spread** is the difference between the yield on a longer-term bond yield and the yield on a short-term bond. Evidence suggests that normal term spread is positive so the yield curve is upward sloping. Recall that the risk premium for uncertainty in inflation (θ) is higher for longer maturity bonds. Positive term spreads can be attributed to increasing θ for longer periods.

LOS 39.e: Describe the factors that affect yield spreads between non-inflation-adjusted and inflation-indexed bonds.

The difference between the yield of a non-inflation-indexed risk-free bond and the yield of an inflation-indexed risk-free bond of the same maturity is the **break-even inflation rate (BEI)**.

$$\text{BEI} = \text{yield on non-inflation-indexed bond} - \text{yield on inflation-indexed bond}$$

Recall that for longer maturity bonds, the nominal rate is composed of the real rate, expected inflation, and a risk premium for inflation uncertainty. Therefore, BEI is composed of two elements: expected inflation (π) and a risk premium for uncertainty about actual inflation (θ).

$$\text{BEI} = \pi + \theta$$

LOS 39.f: Explain how the phase of the business cycle affects credit spreads and the performance of credit-sensitive fixed-income instruments.

The required rate of return for bonds with credit risk includes an additional risk premium. This credit risk premium (credit spread) is the difference in yield between a credit risky bond and a default-free bond of the same maturity.

$$\text{Required rate of return for credit risky bonds} = R + \pi + \theta + \gamma$$

where:

$$\gamma = \text{additional risk premium for credit risk} = \text{credit spread}$$

Credit spreads tend to rise during times of economic downturns and fall during expansions. Research has shown that defaults increase, and recovery rates decrease,

during periods of economic weakness. Both effects result in greater credit losses during economic downturns.

When credit spreads narrow, credit risky bonds will outperform default-free bonds. Overall, lower rated bonds tend to benefit more than higher rated bonds from a narrowing of credit spreads (their yields fall more). Conversely, when credit spreads widen, higher rated bonds will outperform lower rated bonds on a relative basis (because their yields will rise less).



MODULE QUIZ 39.1

1. Carrier, Inc.'s stock price fell last week, which was contrary to the movement in the industry index. Which of the following is *most likely* a valid reason for that to occur?
 - A. An increase in the real risk-free rate.
 - B. Inflation is expected to be higher.
 - C. Investors are demanding a higher risk premium on Carrier.
2. Sonic, Inc., reported 12% earnings growth year-over-year, but its stock price fell. Which of the following is the most likely explanation?
 - A. Sonic's stock price included an event risk premium prior to the earnings announcement.
 - B. The market's expectation was for Sonic to report an earnings growth of more than 12%.
 - C. Market sentiment is often subjective and biased.
3. Which of the following statements is *most accurate*? Higher expected GDP growth would:
 - A. lower the utility of future consumption and reduce the inter-temporal rate of substitution.
 - B. increase the utility of future consumption and reduce the inter-temporal rate of substitution.
 - C. lower the utility of future consumption and increase the inter-temporal rate of substitution.
4. Break-even inflation rate is comprised of the:
 - A. real rate and unexpected inflation.
 - B. expected inflation and risk premium for inflation uncertainty.
 - C. inter-temporal rate of substitution and expected inflation.
5. An economy just getting out of recession would *most likely* have:
 - A. high short-term rates and an inverted yield curve.
 - B. low short-term rates and an inverted yield curve.
 - C. low short-term rates and an upward sloping yield curve.
6. Zeon Corp's 10-year bonds are currently yielding 7.50%. The real rate is 3% and expected inflation is 2%. Which of the following is *most accurate*? Credit spread on Zeon bonds is:
 - A. equal to 2.50%.
 - B. less than 2.50%.
 - C. greater than 2.50%.

MODULE 39.2: THE BUSINESS CYCLE



Video covering this content is available online.

LOS 39.g: Explain how the characteristics of the markets for a company's products affect the company's credit quality.

Analysis of credit spreads by industrial sectors reveals that spreads differ among sectors and over time. Differences in credit spreads are primarily due to differences in industry products and services and the financial leverage of the firms in the industry. Spreads for issuers in the consumer cyclical sector increase significantly during economic downturns compared to spreads for issuers in the consumer non-cyclical sector.

LOS 39.h: Explain the relationship between the consumption-hedging properties of equity and the equity risk premium.

The discount rate used to value equity securities includes an additional risk premium, the equity risk premium. This risk premium is in addition to the risk premium on credit risky bonds because equity is more risky than debt.

$$\text{Discount rate for equity} = R + \pi + \theta + \gamma + \kappa$$

where:

κ = additional risk premium relative to risky debt for an investment in equities

λ = equity risk premium = $\gamma + \kappa$

Assets that provide a higher payoff during economic downturns are more highly valued because of the *consumption hedging property* of the asset. This property reduces the risk premium on an asset. Equity prices are generally cyclical, with higher values during economic expansions when the marginal utility of consumption is lower. Equity investments, therefore, are not the most effective hedge against bad consumption outcomes. Because of this poor consumption hedging ability, equity risk premium is positive.

LOS 39.i: Explain how the phase of the business cycle affects short-term and long-term earnings growth expectations.

Corporate earnings may be related to the business cycle. Cyclical industries (e.g., durable goods manufacturers and consumer discretionary) tend to be relatively more sensitive to the phase of the business cycle. Companies in these industries have revenues and earnings that rise and fall with the rate of economic growth. Defensive or non-cyclical industries (e.g., consumer non-discretionary) tend to be relatively immune to fluctuations in economic activity; their earnings tend to be relatively stable throughout the business cycle.

LOS 39.j: Describe cyclical effects on valuation multiples.

Price multiples such as P/E and P/B are often used in determining the relative values of companies, of sectors, or of the overall market from a historical perspective. However, it is inappropriate to judge the multiple in a historical context only. If the P/E ratio for S&P 500 is above historical standards, it could be that the index is overvalued, but it also could be that the index level is justified by current conditions.

Price multiples are positively correlated with expected earnings growth rates and negatively correlated to required returns. Therefore, price multiples rise with increases in expected future earnings growth and with a decrease in any of the components of the required rate of return (the real rate, expected inflation, the risk premium for inflation uncertainty, or the equity risk premium). As a result, the equity risk premium declines during economic expansions and rises during recessions.

Shiller's CAPE (real cyclically adjusted P/E) ratio reduces the volatility of unadjusted P/E ratios by using real (i.e., inflation-adjusted) prices in the numerator and a 10-year moving average of real earnings in the denominator.

LOS 39.k: Describe the economic factors affecting investment in commercial real estate.

Commercial real estate investments have:

- Bond-like characteristics. The steady rental income stream is similar to cash flows from a portfolio of bonds. Furthermore, just as the credit quality of issuers affects the value of a bond portfolio, the credit quality of tenants affects the value of commercial real estate.
- Equity-like characteristics. The value of commercial real estate is influenced by many factors, including the state of the economy, the demand for rental properties, and property location. Uncertainty about the value of the property at the end of the lease term gives commercial properties an equity-like character.
- Illiquidity. Real estate as an asset class is characterized by illiquidity; it could take years to exit a real estate investment at its fair value.

Valuation

When estimating the value of real estate investment, the discount rate includes an additional risk premium for the lack of liquidity:

$$\text{Discount rate for commercial real estate} = R + \pi + \theta + \gamma + \kappa + \varphi$$

where:

κ = risk premium for uncertainty about terminal value of property (similar to the equity risk premium)

φ = risk premium for illiquidity

While rental income from commercial properties seems to be more or less steady across business cycles, commercial property values tend to be very cyclical. Because of this, the correlation of commercial property values with those of other asset classes (e.g., equities) tends to be positive. Similar to equities, real estate provides a poor hedge against bad consumption outcomes. Therefore, the risk premium required by investors for investment in commercial properties will be relatively high and often close to the risk premium required for equity investments.



MODULE QUIZ 39.2

1. Compared to the credit spreads of issuers classified as consumer non-cyclical, during economic downturns credit spreads on issuers classified as consumer cyclical are most likely to widen:

- A. more.
 - B. less.
 - C. approximately the same amount.
2. Earnings of companies in the consumer staples industry are *most likely* to:
 - A. fluctuate with the business cycle.
 - B. remain stable over the business cycle.
 - C. fluctuate more than companies in consumer discretionary industries.
 3. Which of the following statements is *most accurate*? Equity as an asset class provides:
 - A. good consumption hedging properties and, therefore, commands a positive risk premium.
 - B. poor consumption hedging properties and, therefore, commands a positive risk premium.
 - C. good consumption hedging properties and, therefore, commands a negative risk premium.
 4. Analysis of price multiples is *most likely* to indicate that the equity risk premium:
 - A. declines during economic downturns.
 - B. is stable over the business cycle.
 - C. declines over economic expansions.
 5. Relative to other asset classes, investors in commercial real estate are *least likely* to require a risk premium for:
 - A. uncertainty in inflation.
 - B. illiquidity.
 - C. uncertainty in terminal value.

KEY CONCEPTS

LOS 39.a

The value of any asset can be computed as present value of its expected future cash flows discounted at an appropriate risk-adjusted discount rate. Risky cash flows require the discount rate to be higher due to inclusion of a risk premium.

LOS 39.b

Market prices reflect current expectations. Only changes in expectations cause a change in market price.

LOS 39.c

Interest rates are positively related to GDP growth rate and to the expected volatility in GDP growth due to a higher risk premium.

LOS 39.d

When the economy is in recession, short-term policy rates tend to be low. Investor expectations about higher future GDP growth and inflation as the economy comes out of recession lead to higher longer-term rates. This leads to positive slope of the yield curve. Conversely, an inversely sloping yield curve is often considered a predictor of future recessions.

LOS 39.e

Break-even inflation rate (BEI)

$$= \text{yield on non-inflation indexed bonds} - \text{yield on inflation indexed bonds}$$

BEI is comprised of two elements: expected inflation (π) and risk premium for uncertainty in inflation (θ).

LOS 39.f

Credit spreads tend to rise during times of economic downturns and shrink during expansions. When spreads narrow, lower-rated bonds tend to outperform higher-rated bonds.

LOS 39.g

Spreads for issuers in consumer cyclical sector widen considerably during economic downturns compared to spreads for issuers in the consumer non-cyclical sector.

LOS 39.h

Equities are generally cyclical; they have higher values during good times and have poor consumption hedging properties. Therefore, the risk premium on equities should be positive.

LOS 39.i

Cyclical industries (e.g., durable goods manufacturers and consumer discretionary) tend to be extremely sensitive to the business cycle; their earnings rise during economic expansions and fall during contractions. Non-cyclical or defensive industries tend to have relatively stable earnings.

LOS 39.j

Price multiples tend to follow the business cycle: multiples rise during economic expansions (as analysts revise growth estimates upward) and fall during contractions (as growth estimates are revised downward).

LOS 39.k

Commercial real estate has equity-like and bond-like characteristics. The valuation depends on the rental income stream, the quality of tenants, and the terminal value at the end of the lease term. The discount rate for commercial real estate includes a risk premium for uncertainty in terminal value and also for illiquidity.

ANSWER KEY FOR MODULE QUIZZES

Module Quiz 39.1

1. **C** If the real risk-free rate had increased or expected inflation had been higher, the discount rate would have been higher and would have lowered both Carrier's stock price and industry index. Given the divergence between Carrier's stock price and the industry index, a higher risk premium for Carrier's stock is the only valid reason from the choices provided. (LOS 39.a)
2. **B** Market prices embed current expectations. If the market reaction to earnings growth of 12% was negative, it would mean that the market prices were based on a higher earnings growth rate expectation. (LOS 39.b)
3. **A** A higher GDP growth rate would mean higher incomes in the future. Due to the principle of diminishing marginal utility, the utility of future consumption

would, therefore, be lower. Lower future utility relative to the utility of current consumption lowers the inter-temporal rate of substitution. (LOS 39.c)

4. **B** BEI = expected inflation + risk premium for uncertainty in inflation. (LOS 39.e)
5. **C** An economy just getting out of recession is more likely to have low short-term rates, as the central bank policy rate would be low. Higher future GDP growth prospects would mean higher real rates and higher expected inflation over the longer term, so long-term rates would be high, leading to an upward sloping yield curve. (LOS 39.d)
6. **B** Yield on risky corporate debt = real risk-free rate + expected inflation + risk premium for inflation uncertainty + credit spread. 2.50% = risk premium for inflation uncertainty + credit spread. Given that the bond is long term, the risk premium for inflation uncertainty must be positive and credit spread must be less than 2.50%. (LOS 39.f)

Module Quiz 39.2

1. **A** Credit spreads on consumer cyclical issuers widen during economic downturns and narrow during economic expansions. (LOS 39.g)
2. **B** Earnings of consumer staples companies tend to be relatively stable over the entire business cycle. (LOS 39.i)
3. **B** Stocks in general tend to perform well during economic expansions and, therefore, pay off during good economic times. The property of performing poorly during bad economic times implies that equities are a poor consumption hedge. Because they are a poor consumption hedge, investors demand a positive risk premium for investing in equities. (LOS 39.h)
4. **C** Price multiples tend to expand during economic expansions, suggesting that the equity risk premium declines during expansions. This is because investors become less risk averse during economic expansions and demand a lower premium for taking risk. (LOS 39.j)
5. **A** Two risk premiums that are unique to real estate as an asset class are the risk premium for illiquidity and the risk premium for uncertainty in terminal value (similar to the equity risk premium). (LOS 39.k)

READING 40

ANALYSIS OF ACTIVE PORTFOLIO MANAGEMENT

EXAM FOCUS

The information ratio is used to evaluate active managers and can be used to make portfolio allocation decisions for an investor. There are lots of formulas and linkages to be on top of for this reading. Understand the differences between the Sharpe ratio and the information ratio. Be able to describe the full fundamental law and what influences each of the components. Understand the application of the fundamental law in the context of market timing and sector rotation strategies. Finally, be aware of the limitations of the fundamental law.

MODULE 40.1: VALUE ADDED BY ACTIVE MANAGEMENT



Video covering this content is available online.

LOS 40.a: Describe how value added by active management is measured.

Active management seeks to add value by outperforming a passively managed benchmark portfolio.

Benchmark Qualities

An appropriate benchmark should:

1. be representative of the investment universe from which the active manager may choose.
2. be replicable at low cost.
3. have weights that are available beforehand (ex-ante), and benchmark returns that can be obtained promptly afterwards (ex-post).



PROFESSOR'S NOTE

In this topic review, we are going to assume that the systematic risk of the active portfolio is the same as the systematic risk of the benchmark portfolio (i.e., the beta of the active portfolio relative to the benchmark is 1). If the beta of the actively managed portfolio is different than the beta of the benchmark, active return is computed as the difference in risk-adjusted returns and is known as **alpha**.

Active Return

Active return (R_A) is the value added by active management. Active return can be measured ex-ante (i.e., based on expectations) or ex-post ("after the fact"). Ex-ante active return is the difference between the expected return of an actively managed portfolio and the expected return of its benchmark:

$$E(R_A) = E(R_P) - E(R_B)$$

Active weights in a portfolio determine the amount of value added. Active weight is the difference between a security's weight in an actively managed portfolio and its weight in the benchmark portfolio. Overweighted (underweighted) securities have positive (negative) active weights. Active weights must sum to zero.

For an active portfolio of N securities:

$$E(R_A) = \sum \Delta w_i E(R_i)$$

where:

$$\Delta w_i = \text{active weight of security } i = w_{Pi} - w_{Bi}$$

Ex-post active return is the difference between the realized return of the actively managed portfolio and its benchmark portfolio.

EXAMPLE: Active return

The following information is available for an actively managed portfolio and its benchmark.

Security (i)	Portfolio Weight (w_{Pi})	Benchmark Weight (w_{Bi})	Expected Return $E(R_i)$
A	22%	25%	12%
B	20%	25%	-6%
C	21%	25%	4%
D	37%	25%	19%

Calculate the ex-ante active return.

Answer:

$$\text{Active return} = E(R_P) - E(R_B)$$

$$\begin{aligned} E(R_P) &= \sum w_{Pi}(R_i) \\ &= (0.22)(0.12) + (0.20)(-0.06) + (0.21)(0.04) + (0.37)(0.19) \\ &= 0.0931 \text{ or } 9.31\% \end{aligned}$$

$$\begin{aligned} E(R_B) &= \sum w_{Bi}(R_i) \\ &= (0.25)(0.12) + (0.25)(-0.06) + (0.25)(0.04) + (0.25)(0.19) \\ &= 0.0725 \text{ or } 7.25\% \end{aligned}$$

$$E(R_A) = 0.0931 - 0.0725 = 0.0206 \text{ or } 2.06\%$$

Alternatively:

Security (i)	Portfolio Weight (W_{Pi})	Benchmark Weight (W_{Bi})	Return R_i	Active Weight (ΔW_i)
A	22%	25%	12%	-3%
B	20%	25%	-6%	-5%
C	21%	25%	4%	-4%
D	37%	25%	19%	12%

$$\begin{aligned}
 E(R_A) &= \sum \Delta w_i E(R_i) \\
 &= (-0.03)(0.12) + (-0.05)(-0.06) + (-0.04)(0.04) + (0.12)(0.19) \\
 &= 2.06\%
 \end{aligned}$$

Given an investment strategy involving multiple asset classes, expected returns on the active and benchmark portfolios can be computed as the weighted average of securities returns:

$$E(R_P) = \sum w_{Pj} E(R_{Pj}) \text{ and } E(R_B) = \sum w_{Bj} E(R_{Bj})$$

Ex-ante active return is the expected return on the active portfolio minus the expected return on the benchmark:

$$E(R_A) = \sum w_{Pj} E(R_{Pj}) - \sum w_{Bj} E(R_{Bj})$$

Alternatively, active return can be decomposed into two parts:

1. **Asset allocation return** (from deviations of asset class portfolio weights from benchmark weights).
2. **Security selection return** (from active returns within asset classes).

$$E(R_A) = \sum \Delta w_j E(R_{Bj}) + \sum w_{Pj} E(R_{A,j})$$

where:

$$\sum \Delta w_j E(R_{Bj}) = \text{return from asset allocation}$$

$$\sum w_{Pj} E(R_{A,j}) = \text{return from security selection}$$

$$E(R_{A,j}) = \text{expected active return within asset classes} = E(R_{Pj}) - E(R_{Bj})$$

Consider an active portfolio manager with a benchmark portfolio composed of 25% stocks and 75% bonds. The portfolio manager could overweight stocks (and underweight bonds), resulting in a difference in return relative to the benchmark; this is the asset allocation return. The manager can also choose to have higher weight to a specific stock within the allocation to stocks (and correspondingly underweight some other stocks). This contributes to the security selection return.

EXAMPLE: Active return

Optoma Fund invests in three asset classes: U.S. equities, U.S. bonds, and international equities. The asset allocation weights of Optoma and the expected performance of each asset class and the benchmark are shown in the following table.

Asset Class (i)	Portfolio Weight (W_{Pi})	Benchmark Weight (W_{Bi})	Portfolio Return $E(R_{Pi})$	Benchmark Return $E(R_{Bi})$
U.S. equities	45%	40%	11%	12%
U.S. bonds	30%	30%	6%	5%
International equities	25%	30%	14%	12%

Calculate the expected active return.

Answer:

Asset Class (i)	Portfolio Weight (W_{Pi})	Benchmark Weight (W_{Bi})	Portfolio Return $E(R_{Pi})$	Benchmark Return $E(R_{Bi})$	Active Weight (ΔW_i)
U.S. equities	45%	40%	11%	12%	5%
U.S. bonds	30%	30%	6%	5%	0%
International equities	25%	30%	14%	12%	-5%
Total					

Asset Class (i)	$(\Delta W_i) \times E(R_{Bi})$	$E(A_i) = E(R_{Pi}) - E(R_{Bi})$	$(W_{Pi}) \times E(A_i)$
U.S. equities	0.60%	-1%	-0.45%
U.S. bonds	0.00%	1%	0.30%
International equities	-0.60%	2%	0.50%
Total	0.00%		0.35%

$$E(R_A) = \sum w_{Pi} E(R_{Pi}) - \sum w_{Bi} E(R_{Bi}) = 10.25\% - 9.90\% = 0.35\%$$

Alternatively,

$$E(R_A) = \sum \Delta w_i E(R_{Bi}) + \sum w_{Pi} E(R_{A,i}) = 0.00\% + 0.35\% = 0.35\%$$

It can be seen that all of the expected active return is attributable to security selection. The active weights do not contribute to any asset allocation return.



MODULE QUIZ 40.1

- When measuring value added by active management, it is *most accurate* to state that the active weights in an actively managed portfolio:
 - must add to 100%.
 - are the differences between an individual asset's weight in the actively managed portfolio versus the corresponding weight in an equally-weighted portfolio.
 - must be positively correlated with realized asset returns for value added to be positive.

MODULE 40.2: THE INFORMATION RATIO VS. THE SHARPE RATIO



Video covering this content is available online.

LOS 40.b: Calculate and interpret the information ratio (ex post and ex ante) and contrast it to the Sharpe ratio.

The information ratio and the Sharpe ratio are two different methods of measuring a portfolio's risk-adjusted rate of return.

The **Sharpe ratio (SR)** is calculated as excess return per unit of risk (standard deviation):

$$SR = \frac{R_P - R_F}{\sigma_P}$$

An important attribute of the Sharpe ratio is that it is *unaffected by the addition of cash or leverage* in the portfolio. A 50% allocation to the risk-free asset would reduce both the excess return and standard deviation of returns by half.

The **information ratio (IR)** is the ratio of the active return to the standard deviation of active returns, which is known as **active risk** or **benchmark tracking risk**:

$$IR = \frac{R_P - R_B}{\sigma_{(R_P - R_B)}} = \frac{R_A}{\sigma_A} = \frac{\text{active return}}{\text{active risk}}$$

Some Important Points

- In this topic review, the information ratio that we are considering is usually the ex-ante information ratio (i.e., the information ratio based on expectations). The ex-ante information ratio is generally positive (otherwise active management is not worth pursuing), while ex-post information ratios will often turn out to be negative.
- A **closet index fund** is a fund that is purported to be actively managed but in reality closely tracks the underlying benchmark index. These funds will have a Sharpe ratio similar to that of the benchmark index, a very low information ratio, and little active risk. After fees, the information ratio of a closet index fund is often negative.
- A fund with zero systematic risk (e.g., a market-neutral long-short equity fund) that uses the risk-free rate as its benchmark would have an information ratio that is equal to its Sharpe ratio. This is because active return will be equal to the portfolio's return minus the risk-free rate, and active risk will be equal to total risk.
- Unlike the Sharpe ratio, the information ratio will change with the addition of cash or the use of leverage. The numerator (active return) of the information ratio is measured relative to a noncash benchmark. Adding cash to a portfolio is likely to lower active return, while active risk (i.e., volatility of active return) should not change much, meaning that the addition of cash is most likely to decrease the information ratio.
- The information ratio of an unconstrained portfolio is unaffected by the aggressiveness of the active weights. If the active weights of a portfolio are tripled, the active return and the active risk both triple, leaving the information ratio unchanged.
- If we combine an actively managed portfolio with an allocation to the benchmark portfolio, the resulting blended portfolio will have the same information ratio as the original actively managed portfolio. As we increase the weight of the benchmark portfolio, the active return and active risk decrease proportionately, leaving the information ratio unchanged.
- Investors can select an appropriate amount of active risk by investing a portion of their assets in the active portfolio and the remaining portion in the benchmark. For example, if the active risk of a fund is 10%, an investor seeking to limit active risk to 6% can do so by investing 60% in the active portfolio and the remaining 40% in the benchmark portfolio.

For an unconstrained active portfolio, the optimal amount of active risk is the level of active risk that maximizes the portfolio's Sharpe ratio. This **optimal active risk** can be calculated as:

$$\sigma_A^* = \frac{IR}{SR_B} \sigma_B$$



PROFESSOR'S NOTE

Unconstrained active portfolios have optimal weights for each of the securities in the portfolio based on ex ante expectations of active return and active risk. Sometimes constraints (e.g., long positions only) are imposed on active portfolios, resulting in less than optimal weights. We will discuss this in detail later in this topic review.

The Sharpe ratio of a portfolio with optimal level of active risk can be calculated as:

$$SR_P = \sqrt{SR_B^2 + IR^2}$$

Furthermore, the total risk of the portfolio is given by:

$$\sigma_P^2 = \sigma_B^2 + \sigma_A^2$$

EXAMPLE: Optimal active risk

Omega fund has an information ratio of 0.2 and active risk of 9%. The benchmark portfolio has a Sharpe ratio of 0.4 and total risk of 12%. If a portfolio (portfolio P) with an optimal level of active risk has been constructed by combining Omega fund and the benchmark portfolio, calculate:

1. Portfolio P's Sharpe ratio.
2. Portfolio P's excess return (i.e., return above the risk-free rate).
3. The proportion of benchmark and Omega fund in portfolio P.

Answer:

$$1. \text{ Optimal active risk} = \sigma_A^* = \frac{IR}{SR_B} \sigma_B = \frac{0.2}{0.4} (12\%) = 6\%$$

Based on Omega's information ratio of 0.2, the Sharpe ratio of portfolio P with an optimal level of active risk will be $(0.4^2 + 0.2^2)^{1/2} = 0.4472$

2. The expected active return given an active risk of 6% is:

$$E(R_A) = IR \times \sigma_A = 0.2 \times 0.06 = 1.2\% = (R_P - R_B)$$

Given the benchmark Sharpe ratio of 0.4 and a benchmark total risk of 12%,

$$0.40 = \frac{R_B - R_F}{\sigma_B} = \frac{R_B - R_F}{0.12}$$

Therefore,

$$(R_B - R_F) = 4.8\%,$$

$$\text{portfolio P's excess return} = (R_P - R_F) = (R_P - R_B) + (R_B - R_F) = 1.2\% + 4.8\% = 6.0\%,$$

$$\text{and } \sigma_P^2 = 0.12^2 + 0.06^2 = 0.018 \text{ and } \sigma_P = 0.134$$

The Sharpe ratio of portfolio P then is: $SR = 6\% / 13.4\% = 0.4472$ (as calculated before).

3. The optimal level of active risk is 6% and Omega fund has an active risk of 9%, so we can calculate that $6\% / 9\% = 67\%$ of portfolio P's allocation will be to the Omega fund and 33% to the benchmark portfolio.



MODULE QUIZ 40.2

- Which of the following statements regarding the ex-post and ex-ante information ratio and Sharpe ratio is *most accurate*?
 - The Sharpe ratio measures reward per unit of risk in benchmark relative returns.
 - The information ratio measures reward per unit of absolute risk.
 - The information ratio can be applied either ex ante to expected returns or ex post to realized returns.

MODULE 40.3: THE FUNDAMENTAL LAW



Video covering this content is available online.

LOS 40.c: Describe and interpret the fundamental law of active portfolio management, including its component terms—transfer coefficient, information coefficient, breadth, and active risk (aggressiveness).

There are three factors that determine the information ratio:

- The **information coefficient (IC)** is a measure of a manager's skill. IC is the *ex-ante* (i.e., expected), risk-weighted correlation between active returns and forecasted active returns. The ex-post information coefficient, IC_R measures *actual* correlation between active returns and expected active returns.
- The **transfer coefficient (TC)** can be thought of as the correlation between actual active weights and optimal active weights. The optimal active weight for a security is positively related to its expected active return and negatively related to its expected active risk. For an unconstrained active portfolio, the active weights will be equal to the optimal weights and $TC = 1$. For a constrained portfolio (e.g., constraints on short positions or active risk), TC may be less than 1.

More precisely, transfer coefficient is the cross-sectional correlation between the forecasted active returns and the actual weights adjusted for risk:

$$TC = \text{CORR}(\mu_i / \sigma_i, \Delta w_i \sigma_i) = \text{CORR}(\Delta w_i^* \sigma_i, \Delta w_i \sigma_i)$$

where:

μ_i = the ex-ante active return for security i

- **Breadth (BR)** is the number of independent active bets taken per year. For example, if a manager takes active positions in 10 securities each month, then $BR = 10 \times 12 = 120$.

The **Grinold rule** allows us to compute the expected active return based on the information coefficient, active risk, and a standardized score:

$$\mu_i = IC \sigma_i S_i$$

where:

S_i = score of security i (standardized with an assumed variance of 1)

The expected value added by active management is:

$$E(R_A) = \sum \Delta w_i \mu_i$$

For an unconstrained portfolio, $TC = 1$ and optimal values are denoted by asterisks (*):

$$\begin{aligned} IR^* &= IC \sqrt{BR} \\ E(R_A)^* &= IC \sqrt{BR} \sigma_A \end{aligned}$$

For constrained portfolios, the actual active weights (Δw_i) will differ from the optimal active weights (Δw_i^*) and the transfer coefficient will be less than 1. In this case, we have:

$$\begin{aligned} IR &= (TC) IC \sqrt{BR} \\ E(R_A) &= (TC) IC \sqrt{BR} \sigma_A \end{aligned}$$

Because transfer coefficients are always less than one ($TC < 1$), the information ratio must be less than the optimal information ratio ($IR < IR^*$), and the expected active return must be less than the optimal expected active return $E(R_A) < E(R_A)^*$.

Recall that the optimal level of active risk (in an unconstrained portfolio) is a function of the information ratio, the Sharpe ratio of the benchmark, and the standard deviation of the benchmark return:

$$\sigma_A^* = \frac{IR}{SR_B} \sigma_B$$

For a constrained portfolio, the optimal level of active risk (σ_{CA}^*) is calculated as:

$$\sigma_{CA}^* = TC \frac{IR^*}{SR_B} \sigma_B$$

where:

IR^* = the information ratio of an unconstrained portfolio

This implies that the optimal active risk of a constrained portfolio will be less than the optimal active risk of an unconstrained portfolio. Similarly, the Sharpe ratio of a constrained portfolio is lower than the Sharpe ratio of an unconstrained portfolio and is given by:

$$SR_{PC} = \sqrt{SR_B^2 + TC^2 \times IR^{*2}}$$

Ex-Post Performance Measurement

Realized value added from active management is the ex-post active return that the manager achieves. Using the ex-post information coefficient IC_R , the fundamental law can be written as:

$$E(R_A | IC_R) = (TC)(IC_R) \sqrt{BR} \sigma_A$$

The actual return on the active portfolio can be expressed as its conditional expected return and a noise term:

$$R_A = E(R_A | IC_R) + \text{noise}$$

where $E(R_A | IC_R)$ represents the expected value added, given the realized skill of the investor that period, and the noise term is the constraint-induced noise.

The proportion of realized active return variance attributed to variation in the realized information coefficient is TC^2 . The remaining $(1 - TC^2)$ is attributed to constraint-induced noise.

LOS 40.d: Explain how the information ratio may be useful in investment manager selection and choosing the level of active portfolio risk.

Portfolio theory concludes that investors will choose some combination of the risk-free asset and an optimal risky portfolio, with the weights determined by their preferences (risk tolerance). The optimal risky portfolio is the portfolio with the highest Sharpe ratio. The Sharpe ratio of an actively managed portfolio is higher than the Sharpe ratio of the benchmark based on the information ratio of the actively managed portfolio. **The portfolio with the highest information ratio will also be the portfolio with the highest Sharpe ratio**, so investors will choose the active manager with the highest information ratio; the actively managed portfolio with the highest information ratio is the optimal (active) portfolio for all investors regardless of their risk tolerance.

The information ratio can be used to determine the expected active return for a given target level of active risk:

$$E(R_A) = IR \times \sigma_A$$



MODULE QUIZ 40.3

- Investors that are constrained by regulation or investment policy may find that some of the important variables identified by the fundamental law of active portfolio management are out of their control. The element that is *most likely* to still be within the investor's control is the:
 - information coefficient.
 - transfer coefficient.
 - benchmark tracking risk.
- The information ratio is *least appropriate* as a criterion for:
 - quantifying an actively managed portfolio's return in excess of the risk-free rate.
 - constructing an actively managed portfolio.
 - evaluating the past performance of actively managed portfolios.

MODULE 40.4: ACTIVE MANAGEMENT



Video covering this content is available online.

LOS 40.e: Compare active management strategies, including market timing and security selection, and evaluate strategy changes in terms of the fundamental law of active management.

Market timing is simply a bet on the direction of the market (or a segment of the market). For example, an active manager may rotate money out of equities and into cash based on an expected decline in stock prices. For a market timer, the information coefficient is based on the proportion of correct calls:

$$IC = 2(\% \text{ correct}) - 1$$

If the manager is correct 50% the time, the IC will equal zero.

EXAMPLE: Market timer vs. security selector

Darsh Bhansali is a manager with Optimus Capital. Bhansali, a market timer, makes quarterly asset allocation decisions based on his forecast of the direction of the market. Bhansali's forecasts are right 55% of the time.

Mike Neal is an equity analyst focusing on technology stocks. Neal, a security selector, typically makes 50 active stock selections annually. Neal has an information coefficient of 0.04.

Compute the information ratios of Bhansali and Neal assuming that both managers construct unconstrained portfolios.

Answer:

Because both portfolios are unconstrained, $TC = 1$.

Bhansali's $IC = 2(0.55) - 1 = 0.10$

Bhansali's $IR = IC \sqrt{BR} = (0.10) \sqrt{4} = 0.20$

Neal's $IR = IC \sqrt{BR} = (0.04) \sqrt{50} = 0.28$

Sector Rotation

Market timing can also be used to make **sector rotation** decisions. For example, an active manager may allocate assets into sectors that are expected to outperform. Consider a two sector market made up of sectors X and Y. Assume the expected sector return and volatility of returns are $E(R_X)$ and σ_X for Sector X, and $E(R_Y)$ and σ_Y for Sector Y.

If the correlation between the returns of sectors X and Y is given by r_{XY} , the active risk of this strategy is the standard deviation of differential returns of the two sectors (i.e., $R_X - R_Y$) and is given by σ_C :

$$\sigma_C = [\sigma_X^2 - 2\sigma_X\sigma_Y r_{XY} + \sigma_Y^2]^{1/2}$$

The annualized active risk is a function of the number of bets made during the year. If, for example, the active manager makes quarterly bets, $BR = 4$:

$$\text{annualized active risk} = \sigma_A = \sigma_C \times \sqrt{BR}$$

$$\text{and the annualized active return} = E(R_A) = IC \times \sqrt{BR} \times \sigma_A$$

EXAMPLE: Sector rotation

Hwang Soi makes monthly allocation decisions between consumer discretionary and consumer staples based on a proprietary model. The historical correlation between the returns of the two sectors is 0.30 and Soi's bets have been correct 60% of the time. Further information is in the following table.

Sector	E(R)	σ	Benchmark Weight
Consumer staples	10.8%	3.0%	65%
Consumer discretionary	13.2%	5.0%	35%

1. What is the annualized active risk of Soi's sector rotation strategy?
2. What is the expected annualized active return of Soi's sector rotation strategy?

3. What will be the allocation to the consumer discretionary sector if Soi feels that consumer staples will outperform the consumer discretionary sector over the next month and if the active risk is limited to 5.20%?

Answer:

1. Monthly active risk = σ_C

$$\begin{aligned} &= [\sigma_X^2 - 2\sigma_X\sigma_Y r_{XY} + \sigma_Y^2]^{1/2} \\ &= [0.03^2 - 2(0.03)(0.05)(0.30) + 0.05^2]^{1/2} \\ &= 0.05 \text{ or } 5\% \end{aligned}$$

$$\text{Annualized active risk} = 0.05 \times (12)^{1/2} = 0.1732 \text{ or } 17.32\%$$

2. $IC = 2(0.60) - 1 = 0.20$

$$\begin{aligned} \text{Annualized active return} &= IC \times \sqrt{BR} \times \sigma_A \\ &= 0.20 \times (12)^{1/2} \times 0.1732 \\ &= 0.12 \text{ or } 12\% \end{aligned}$$

Alternatively, active return from this strategy using a probability weighted average (given that Soi makes correct calls 60% of time) of combined risk is:

$$(0.60)(0.05) + (0.40)(-0.05) = 0.01 \text{ or } 1\% \text{ per month.}$$

$$\text{Annual active return} = 1\% \times 12 = 12\%.$$

3. If active risk is limited to 5.20%, the deviation from the benchmark weights of 65% and 35% is limited to $(5.20\% / 17.32\%) = 30\%$. When Soi feels that consumer staples will outperform, the allocation to that sector will be 65% + 30%, or 95%, and the allocation to consumer discretionary will be 5%.

LOS 40.f: Describe the practical strengths and limitations of the fundamental law of active management.

As we previously demonstrated, the fundamental law can be used to evaluate a range of active strategies, including security selection, market timing, and sector rotation. The practical limitations of the fundamental law of active management can be summarized as “garbage in, garbage out;” poor input estimates lead to incorrect evaluations. In the case of unconstrained optimization, the two components (inputs) that determine the information ratio are (1) the information coefficient (IC) and (2) the breadth (BR) of the manager’s strategy.

The limitations are generally derived from inaccurate estimates of the two inputs:

- *Ex-ante measurement of skill:* The information coefficient is an estimate of the accuracy of an active manager’s forecasts on an ex-ante basis. One problem with this is that managers tend to overestimate their ability to outperform the market and, hence, overestimate their IC. Regardless of the bias, the accuracy of the IC determines the accuracy of the ex-ante information ratio.
- *Independence:* The breadth of a strategy is meant to measure the number of truly independent decisions that an active manager makes. If two or more decisions rely on same (or similar) information, then they are not independent. If individual decisions are correlated, then the breadth can be estimated as:

$$BR = \frac{N}{1 + (N - 1)r}$$

where:

N = number of decisions

r = correlation between the decisions

Decision independence may be compromised by systemic influences within a strategy, the cross-sectional dependency. For example, a value strategy applied to different stocks within an industry may not be truly independent (most stocks will have similar fundamentals, such as P/E ratio). Similarly, decision independence can be compromised by time-series dependency. Monthly rebalancing decisions may not be truly independent from period to period.



MODULE QUIZ 40.4

- Breadth is *most likely* to be equal to the number of securities multiplied by the number of decision periods per year if active returns are correlated:
 - cross-sectionally.
 - over time.
 - with active weights.
- Which of the following factors *least accurately* identifies one of the major limitations of the fundamental law of active management?
 - Ex ante measurement of skill using the information coefficient.
 - Assumption of independence in forecasts across assets and over time.
 - Attribution of value added to a small number of inputs.

KEY CONCEPTS

LOS 40.a

Value-added = active return = active portfolio return – benchmark return

Portfolio active return = $\Sigma(\text{active weight of security } i \times \text{return of security } i)$.

Active return is composed of two parts: asset allocation return plus security selection return:

$$E(R_A) = \Sigma \Delta w_i E(R_{B,i}) + \Sigma w_{P,i} E(R_{A,i})$$

where:

$$E(R_{A,i}) = \text{expected active return within asset classes} = E(R_{P,i}) - E(R_{B,i})$$

LOS 40.b

$$\text{Sharpe ratio} = SR = \frac{R_P - R_F}{\sigma_P}$$

$$\text{Information ratio} = IR = \frac{R_P - R_B}{\sigma_{(R_P - R_B)}} = \frac{R_A}{\sigma_A} = \frac{\text{active return}}{\text{active risk}}$$

$$\text{Unconstrained portfolio optimal active risk} = \sigma_A^* = \frac{IR}{SR_B} \sigma_B$$

The Sharpe ratio of a portfolio comprised of an optimal proportion of benchmark portfolio and active portfolio is $SR_P = \sqrt{SR_B^2 + IR^2}$

LOS 40.c

The three components of the information ratio are the information coefficient (measure of manager's skill), the breadth (number of independent active bets), and the transfer coefficient (the degree of constraints on manager's active management).

$$IR = (TC)IC\sqrt{BR}$$

$$E(R_A) = (TC)IC\sqrt{BR}\sigma_A$$

For an unconstrained portfolio, $TC = 1$.

LOS 40.d

An investor will always choose the active manager with the highest information ratio regardless of her risk aversion. The investor will combine this optimal active portfolio with the benchmark to create a portfolio with a suitable level of optimal risk based on her risk preferences.

LOS 40.e

The information coefficient of a market timer = $IC = 2(\% \text{ correct}) - 1$

The fundamental law can also be used to evaluate active sector rotation strategies.

LOS 40.f

While the fundamental law can be used for evaluating market timing, security selection, and sector rotation strategies, one has to be aware of its practical limitations. The limitations of the fundamental law include bias in measurement of the ex-ante information coefficient and lack of true independence while measuring breadth of an active strategy.

ANSWER KEY FOR MODULE QUIZZES

Module Quiz 40.1

1. **C** Value added will be positive only when end-of-period realized asset returns are positively correlated with the asset weights that the manager selected at the beginning of the period. Active weights are defined as the differences between an asset's weight in a managed portfolio versus its weight in the benchmark portfolio. Active weights in a portfolio must add up to zero, not 100%. (LOS 40.a)

Module Quiz 40.2

1. **C** The information ratio can be applied either ex ante to expected returns or ex post to realized returns. The Sharpe ratio measures reward per unit of absolute (or total) risk. The information ratio measures reward per unit of risk in benchmark relative terms. (LOS 40.b)

Module Quiz 40.3

1. **A** The information coefficient represents an active manager's own skill and ability to forecast returns accurately. The other three of the four elements of the fundamental law of active portfolio management (transfer coefficient, breadth of the strategy, and benchmark tracking risk) may be beyond

investors' control if they are constrained by investment policy or regulation. (LOS 40.c)

2. **A** The information ratio evaluates risk-adjusted return in relation to a benchmark-investment baseline, rather than in relation to a risk-free investment. Expected information ratio is the single best criterion for building an actively managed portfolio. The ex-post information ratio is the best criterion for evaluating the past performance of actively managed funds. (LOS 40.d)

Module Quiz 40.4

1. **C** Breadth (BR) is intended to measure the number of independent decisions that an investor makes each year. Breadth is equal to the number of securities multiplied by the number of decision periods per year only if (1) active returns are cross-sectionally uncorrelated and (2) active returns are uncorrelated over time. (LOS 40.e)
2. **C** The fundamental law of active management's usefulness stems from its ability to separate the expected value added of a portfolio into the contributions of the few basic elements of the strategy. Limitations of the fundamental law of active management concern uncertainty about the ex-ante information coefficient, as well as the definition of breadth as the number of independent decisions. (LOS 40.f)

Topic Quiz: Portfolio Management

You have now finished the Portfolio Management topic section. Please log into your Schweser online dashboard and take the Topic Quiz on this section. The Topic Quiz provides immediate feedback on how effective your study has been for this material. Questions are more exam-like than typical Module Quiz or QBank questions; a score of less than 70% indicates that your study likely needs improvement. These tests are best taken timed; allow three minutes per question.

READING 41 & 42

CODE OF ETHICS AND STANDARDS OF PROFESSIONAL CONDUCT AND GUIDANCE FOR STANDARDS I–VII

EXAM FOCUS

In addition to reading this review of the ethics material, we strongly recommend that all candidates for the CFA® examination read the official CFA Institute curriculum books for ethics; specifically, the included examples and practice questions. The complete *Code and Standards* are reprinted in Volume 6 of the CFA Program Curriculum.

MODULE 41.1: INTRODUCTION TO THE CODE AND STANDARDS



Video covering this content is available online.

LOS 41.a: Describe the six components of the Code of Ethics and the seven Standards of Professional Conduct.

THE CODE OF ETHICS

Members of CFA Institute (including CFA charterholders) and candidates for the CFA designation ("Members and Candidates") must:¹

- Act with integrity, competence, diligence, and respect, and in an ethical manner with the public, clients, prospective clients, employers, employees, colleagues in the investment profession, and other participants in the global capital markets.
- Place the integrity of the investment profession and the interests of clients above their own personal interests.
- Use reasonable care and exercise independent professional judgment when conducting investment analysis, making investment recommendations, taking investment actions, and engaging in other professional activities.
- Practice and encourage others to practice in a professional and ethical manner that will reflect credit on themselves and the profession.
- Promote the integrity and viability of the global capital markets for the ultimate benefit of society.
- Maintain and improve their professional competence and strive to maintain and improve the competence of other investment professionals.

THE STANDARDS OF PROFESSIONAL CONDUCT

- I. Professionalism
 - II. Integrity of Capital Markets
 - III. Duties to Clients
 - IV. Duties to Employers
 - V. Investment Analysis, Recommendations, and Actions
 - VI. Conflicts of Interest
 - VII. Responsibilities as a CFA Institute Member or CFA Candidate
-

LOS 41.b: Explain the ethical responsibilities required of CFA Institute members and candidates in the CFA Program by the Code and Standards.

STANDARDS OF PROFESSIONAL CONDUCT²

I. PROFESSIONALISM

- A. Knowledge of the Law.** Members and Candidates must understand and comply with all applicable laws, rules, and regulations (including the CFA Institute *Code of Ethics* and *Standards of Professional Conduct*) of any government, regulatory organization, licensing agency, or professional association governing their professional activities. In the event of conflict, Members and Candidates must comply with the more strict law, rule, or regulation. Members and Candidates must not knowingly participate or assist in and must dissociate from any violation of such laws, rules, or regulations.
- B. Independence and Objectivity.** Members and Candidates must use reasonable care and judgment to achieve and maintain independence and objectivity in their professional activities. Members and Candidates must not offer, solicit, or accept any gift, benefit, compensation, or consideration that reasonably could be expected to compromise their own or another's independence and objectivity.
- C. Misrepresentation.** Members and Candidates must not knowingly make any misrepresentations relating to investment analysis, recommendations, actions, or other professional activities.
- D. Misconduct.** Members and Candidates must not engage in any professional conduct involving dishonesty, fraud, or deceit or commit any act that reflects adversely on their professional reputation, integrity, or competence.

II. INTEGRITY OF CAPITAL MARKETS

- A. Material Nonpublic Information.** Members and Candidates who possess material nonpublic information that could affect the value of an investment must not act or cause others to act on the information.
- B. Market Manipulation.** Members and Candidates must not engage in practices that distort prices or artificially inflate trading volume with the intent to mislead market participants.

III. DUTIES TO CLIENTS

- A. Loyalty, Prudence, and Care.** Members and Candidates have a duty of loyalty to their clients and must act with reasonable care and exercise prudent judgment. Members and Candidates must act for the benefit of their clients and place their clients' interests before their employer's or their own interests.
- B. Fair Dealing.** Members and Candidates must deal fairly and objectively with all clients when providing investment analysis, making investment recommendations, taking investment action, or engaging in other professional activities.
- C. Suitability.**

1. When Members and Candidates are in an advisory relationship with a client, they must:
 - a) Make a reasonable inquiry into a client's or prospective clients' investment experience, risk and return objectives, and financial constraints prior to making any investment recommendation or taking investment action and must reassess and update this information regularly.
 - b) Determine that an investment is suitable to the client's financial situation and consistent with the client's written objectives, mandates, and constraints before making an investment recommendation or taking investment action.
 - c) Judge the suitability of investments in the context of the client's total portfolio.
2. When Members and Candidates are responsible for managing a portfolio to a specific mandate, strategy, or style, they must make only investment recommendations or take only investment actions that are consistent with the stated objectives and constraints of the portfolio.
- D. **Performance Presentation.** When communicating investment performance information, Members or Candidates must make reasonable efforts to ensure that it is fair, accurate, and complete.
- E. **Preservation of Confidentiality.** Members and Candidates must keep information about current, former, and prospective clients confidential unless:
 1. The information concerns illegal activities on the part of the client or prospective client,
 2. Disclosure is required by law, or
 3. The client or prospective client permits disclosure of the information.

IV. DUTIES TO EMPLOYERS

- A. **Loyalty.** In matters related to their employment, Members and Candidates must act for the benefit of their employer and not deprive their employer of the advantage of their skills and abilities, divulge confidential information, or otherwise cause harm to their employer.
- B. **Additional Compensation Arrangements.** Members and Candidates must not accept gifts, benefits, compensation, or consideration that competes with or might reasonably be expected to create a conflict of interest with their employer's interest unless they obtain written consent from all parties involved.
- C. **Responsibilities of Supervisors.** Members and Candidates must make reasonable efforts to ensure that anyone subject to their supervision or authority complies with applicable laws, rules, regulations, and the Code and Standards.

V. INVESTMENT ANALYSIS, RECOMMENDATIONS, AND ACTIONS

- A. **Diligence and Reasonable Basis.** Members and Candidates must:
 1. Exercise diligence, independence, and thoroughness in analyzing investments, making investment recommendations, and taking investment actions.
 2. Have a reasonable and adequate basis, supported by appropriate research and investigation, for any investment analysis, recommendation, or action.
- B. **Communication with Clients and Prospective Clients.** Members and Candidates must:
 1. Disclose to clients and prospective clients the basic format and general principles of the investment processes they use to analyze investments, select securities, and construct portfolios and must promptly disclose any changes that might materially affect those processes.
 2. Disclose to clients and prospective clients significant limitations and risks associated with the investment process.
 3. Use reasonable judgment in identifying which factors are important to their investment analyses, recommendations, or actions and include those factors in communications with clients and prospective clients.

4. Distinguish between fact and opinion in the presentation of investment analysis and recommendations.

C. **Record Retention.** Members and Candidates must develop and maintain appropriate records to support their investment analysis, recommendations, actions, and other investment-related communications with clients and prospective clients.

VI. CONFLICTS OF INTEREST

A. **Disclosure of Conflicts.** Members and Candidates must make full and fair disclosure of all matters that could reasonably be expected to impair their independence and objectivity or interfere with respective duties to their clients, prospective clients, and employer. Members and Candidates must ensure that such disclosures are prominent, are delivered in plain language, and communicate the relevant information effectively.

B. **Priority of Transactions.** Investment transactions for clients and employers must have priority over investment transactions in which a Member or Candidate is the beneficial owner.

C. **Referral Fees.** Members and Candidates must disclose to their employer, clients, and prospective clients, as appropriate, any compensation, consideration, or benefit received by, or paid to, others for the recommendation of products or services.

VII. RESPONSIBILITIES AS A CFA INSTITUTE MEMBER OR CFA CANDIDATE

A. **Conduct as Participants in CFA Institute Programs.** Members and Candidates must not engage in any conduct that compromises the reputation or integrity of CFA Institute or the CFA designation or the integrity, validity, or security of CFA Institute programs.

B. **Reference to CFA Institute, the CFA Designation, and the CFA Program.** When referring to CFA Institute, CFA Institute membership, the CFA designation, or candidacy in the CFA Program, Members and Candidates must not misrepresent or exaggerate the meaning or implications of membership in CFA Institute, holding the CFA designation, or candidacy in the CFA Program.

MODULE 42.1: STANDARDS I(A) AND I(B)



Video covering this content is available online.

LOS 42.a: Demonstrate a thorough knowledge of the CFA Institute Code of Ethics and Standards of Professional Conduct by applying the Code and Standards to specific situations.

LOS 42.b: Recommend practices and procedures designed to prevent violations of the Code of Ethics and Standards of Professional Conduct.

I Professionalism

I(A) Knowledge of the Law. Members and Candidates must understand and comply with all applicable laws, rules, and regulations (including the CFA Institute Code of Ethics and Standards of Professional Conduct) of any government, regulatory organization, licensing agency, or professional association governing their professional activities. In the event of conflict, Members and Candidates must comply with the more strict law, rule, or regulation. Members and Candidates must not knowingly participate or assist in and must dissociate from any violation of such laws, rules, or regulations.



PROFESSOR'S NOTE

While we use the term “members” in the following, note that all of the Standards apply to candidates as well.

Guidance—Code and Standards vs. Local Law

Members must know the laws and regulations relating to their professional activities in all countries in which they conduct business. Members must comply with applicable laws and regulations relating to their professional activity. Do not violate Code or Standards even if the activity is otherwise legal. Always adhere to the most strict rules and requirements (law or CFA Institute Standards) that apply.

Guidance—Participation or Association With Violations by Others

Members should dissociate, or separate themselves, from any ongoing client or employee activity that is illegal or unethical, even if it involves leaving an employer (an extreme case). While a member may confront the involved individual first, he must approach his supervisor or compliance department. Inaction with continued association may be construed as knowing participation.

Recommended Procedures for Compliance—Members

- Members should have procedures to keep up with changes in applicable laws, rules, and regulations.
- Compliance procedures should be reviewed on an ongoing basis to ensure that they address current law, CFA Institute Standards, and regulations.
- Members should maintain current reference materials for employees to access in order to keep up to date on laws, rules, and regulations.
- Members should seek advice of counsel or their compliance department when in doubt.
- Members should document any violations when they disassociate themselves from prohibited activity and encourage their employers to bring an end to such activity.
- There is no requirement under the Standards to report violations to governmental authorities, but this may be advisable in some circumstances and required by law in others.
- Members are strongly encouraged to report other members’ violations of the Code and Standards.

Recommended Procedures for Compliance—Firms

Members should encourage their firms to:

- Develop and/or adopt a code of ethics.
- Make available to employees information that highlights applicable laws and regulations.
- Establish written procedures for reporting suspected violation of laws, regulations, or company policies.

Members who supervise the creation and maintenance of investment services and products should be aware of and comply with the regulations and laws regarding

such services and products both in their country of origin and the countries where they will be sold.

Application of Standard I(A) Knowledge of the Law³

Example 1:

An analyst working in the underwriting department of a brokerage firm discovers erroneous financial statements that inflated earnings. These statements are with the regulator in preparation for an IPO. The firm's legal counsel suggests that the regulator would have no idea that the analyst was aware of the falsehood, and hence the analyst can ignore it.

Comment:

While advice from counsel is recommended, members should not rely on advice that they know (or should know) is illegal. The member should obtain independent legal advice to determine if the regulator should be informed.

Example 2:

A member's firm advertises firm performance using a composite that excludes accounts that have left the firm. This leads to inflated performance figures.

Comment:

Misrepresenting performance is a violation of the Code and Standards. The member should immediately dissociate from the activity. Additionally, the member should inform their supervisor and compliance officer. If the firm does nothing, the member should seek other employment.

Example 3:

An employee of an investment bank is working on an underwriting and finds out the issuer has altered their financial statements to hide operating losses in one division. These misstated data are included in a preliminary prospectus that has already been released.

Comment:

The employee should report the problem to his supervisors. If the firm doesn't get the misstatement fixed, the employee should dissociate from the underwriting and, further, seek legal advice about whether he should undertake additional reporting or other actions.

Example 4:

Laura Jameson, a U.S. citizen, works for an investment advisor based in the United States and works in a country where investment managers are prohibited from participating in IPOs for their own accounts.

Comment:

Jameson must comply with the strictest requirements among U.S. law (where her firm is based), the CFA Institute Code and Standards, and the laws of the country where she is doing business. In this case that means she must not participate in any IPOs for her personal account.

Example 5:

A junior portfolio manager suspects that a broker responsible for new business from a foreign country is being allocated a portion of the firm's payments for third-party research and suspects that no research is being provided. He believes that the research payments may be inappropriate and unethical.

Comment:

He should follow his firm's procedures for reporting possible unethical behavior and try to get better disclosure of the nature of these payments and any research that is being provided.

I(B) Independence and Objectivity. Members and Candidates must use reasonable care and judgment to achieve and maintain independence and objectivity in their professional activities. Members and Candidates must not offer, solicit, or accept any gift, benefit, compensation, or consideration that reasonably could be expected to compromise their own or another's independence and objectivity.

Guidance

Do not let the investment process be influenced by any external sources. Modest gifts are permitted. Allocation of shares in oversubscribed IPOs to personal accounts is NOT permitted. Distinguish between gifts from clients and gifts from entities seeking influence to the detriment of the client. Gifts must be disclosed to the member's employer in any case, either prior to acceptance if possible, or subsequently.

Guidance—Investment Banking Relationships

Do not be pressured by sell-side firms to issue favorable research on current or prospective investment-banking clients. It is appropriate to have analysts work with investment bankers in "road shows" only when the conflicts are adequately and effectively managed and disclosed. Be sure there are effective "firewalls" between research/investment management and investment banking activities.

Guidance—Public Companies

Analysts should not be pressured to issue favorable research by the companies they follow. Do not confine research to discussions with company management, but rather use a variety of sources, including suppliers, customers, and competitors.

Guidance—Buy-Side Clients

Buy-side clients may try to pressure sell-side analysts. Portfolio managers may have large positions in a particular security, and a rating downgrade may have an effect on the portfolio performance. As a portfolio manager, there is a responsibility to respect and foster intellectual honesty of sell-side research.

Guidance—Fund Manager and Custodial Relationships

Members responsible for selecting outside managers should not accept gifts, entertainment, or travel that might be perceived as impairing their objectivity.

Guidance—Performance Measurement and Attribution

Performance analysts may experience pressure from investment managers who have produced poor results or acted outside their mandate. Members and candidates who analyze performance must not let such influences affect their analysis.

Guidance—Manager Selection

Members and candidates must exercise independence and objectivity when they select investment managers. They should not accept gifts or other compensation that could be seen as influencing their hiring decisions, nor should they offer compensation when seeking to be hired as investment managers. The responsibility to maintain independence and objectivity applies to all a member or candidate's hiring and firing decisions, not just those that involve investment management.

Guidance—Credit Rating Agencies

Members employed by credit rating firms should make sure that procedures prevent undue influence by the firm issuing the securities. Members who use credit ratings should be aware of this potential conflict of interest and consider whether independent analysis is warranted.

Guidance—Issuer-Paid Research

Remember that this type of research is fraught with potential conflicts. Analysts' compensation for preparing such research should be limited, and the preference is for a flat fee, without regard to conclusions or the report's recommendations.

Guidance—Travel

Best practice is for analysts to pay for their own commercial travel when attending information events or tours sponsored by the firm being analyzed.

Recommended Procedures for Compliance

- Protect the integrity of opinions—make sure they are unbiased.
- Create a restricted list and distribute only factual information about companies on the list.
- Restrict special cost arrangements—pay for one's own commercial transportation and hotel; limit use of corporate aircraft to cases in which commercial transportation is not available.
- Limit gifts—token items only. Customary, business-related entertainment is okay as long as its purpose is not to influence a member's professional independence or objectivity. Firms should impose clear value limits on gifts.
- Restrict employee investments in equity IPOs and private placements. Require pre-approval of IPO purchases.
- Review procedures—have effective supervisory and review procedures.
- Firms should have formal written policies on independence and objectivity of research.
- Firms should appoint a compliance officer and provide clear procedures for employee reporting of unethical behavior and violations of applicable regulations.

Application of Standard I(B) Independence and Objectivity

Example 1:

An analyst joins a group of his peers in a tour of a company's facilities. Due to remoteness of the facilities, the company arranges for chartered group flights and for accommodations in the only hotel near the company site. The company pays for all the expenses.

Comment:

Members should comply with Standard I(B) by avoiding even the appearance of a conflict of interest, even if they are not necessarily violating Standard I(B). In general, when allowing companies to pay for travel and/or accommodations, members must use their judgment to ensure that the member's independence and objectivity is not compromised. The itinerary required chartered flights, which the member was not expected to pay for. These arrangements are not unusual and did not violate Standard I(B) so long as the member's independence and objectivity were not compromised.

Example 2:

Maneka Fritz is an equity analyst covering the retail industry. She has concluded that the stock of Outlets "R" Us is overpriced at its current level, but wants to maintain the good relationship that her firm has with the company.

Comment:

Fritz's analysis of the company must be objective and based solely on consideration of company fundamentals.

Example 3:

An analyst in the corporate finance department promises a client that her firm will provide full research coverage of the issuing company after the offering.

Comment:

This is not a violation, but she cannot promise favorable research coverage. Research must be objective and independent.

Example 4:

An employee's boss tells him to assume coverage of a stock and maintain a buy rating.

Comment:

Research opinions and recommendations must be objective and arrived at independently. Following the boss's instructions would be a violation if the analyst determined a buy rating is inappropriate.

Example 5:

A money manager receives a gift of significant value from a client as a reward for good performance over the prior period and informs her employer of the gift.

Comment:

No violation here because the gift is from a client and is not based on performance going forward, but the gift must be disclosed to her employer. If the gift were contingent on future performance, the money manager would have to obtain permission from her employer. The reason for both the disclosure and permission requirements is that the employer must ensure that the money manager does not give advantage to the client giving or offering additional compensation, to the detriment of other clients.

Example 6:

An analyst enters into a contract to write a research report on a company, paid for by that company, for a flat fee plus a bonus based on attracting new investors to the security.

Comment:

This is a violation because the compensation structure makes total compensation depend on the conclusions of the report (a favorable report will attract investors and increase compensation). Accepting the job for a flat fee that does not depend on the report's conclusions or its impact on share price is permitted, with proper disclosure of the fact that the report is funded by the subject company.

Example 7:

A trust manager at a bank selects mutual funds for client accounts based on the profits from "service fees" paid to the bank by the mutual fund sponsor.

Comment:

This is a violation because the trust manager has allowed the fees to affect his objectivity.

Example 8:

An analyst performing sensitivity analysis for a security does not use only scenarios consistent with recent trends and historical norms.

Comment:

This is a good thing and is not a violation.

Example 9:

A member whose firm is seeking to become an investment manager for a labor union contributes a large sum to the union leader's re-election campaign. After the union hires the member's firm, the member continues to spend significant amounts on entertainment for the union leader and his family.

Comment:

Offering gifts or other compensation to influence a decision to hire an investment manager is a violation of Standard I(B).

Example 10:

A member who is a performance analyst notices that one of her firm's top investment managers has changed his composite construction, removing a poorly performing large account and placing it in a different composite. Knowing that the

investment manager is important to the firm and a close friend of the firm's CEO, the member does not disclose this change in her performance report.

Comment:

The member violated Standard I(B) by failing to exercise independence and objectivity in her analysis. Altering composites to conceal poor performance also violates Standard III(D) Performance Presentation and may violate Standard I(C) Misrepresentation.



MODULE QUIZ 41.1, 42.1

1. While working on a new underwriting project, Jean Brayman, CFA, has just received information from her client that leads her to believe that the firm's financial statements in the registration statement overstate the firm's financial position. Brayman should:
 - A. report her finding to the appropriate governmental regulatory authority.
 - B. immediately dissociate herself from the underwriting in writing to the client.
 - C. seek advice from her firm's compliance department as to the appropriate action to take.
2. Karen Jones, CFA, is an outside director for Valley Manufacturing. At a director's meeting, Jones finds out that Valley Corp. has made several contributions to foreign politicians that she suspects were illegal. Jones checks with her firm's legal counsel and determines that the contributions were indeed illegal. At the next board meeting, Jones urges the board to disclose the contributions. The board, however, votes not to make a disclosure. Jones' *most appropriate* action would be to:
 - A. protest the board's actions in writing to the executive officer of Valley.
 - B. resign from the board and seek legal counsel as to her legal disclosure requirements.
 - C. inform her supervisor of her discovery and cease attending meetings until the matter is resolved.
3. Which of the following statements is *least likely* correct? A member or candidate:
 - A. can participate or assist in a violation simply by having knowledge of the violation and not taking action to stop it.
 - B. is held responsible for participating in illegal acts in instances where violation of the law is evident to those who know or should know the law.
 - C. must report evidence of legal violations to the appropriate governmental or regulatory organization.
4. Jack Schleifer, CFA, is an analyst for Brown Investment Managers (BIM). Schleifer has recently accepted an invitation to visit the facilities of ChemCo, a producer of chemical compounds used in a variety of industries. ChemCo offers to pay for Schleifer's accommodations in a penthouse suite at a luxury hotel and allow Schleifer to use the firm's private jet to travel to its three facilities located in New York, Hong Kong, and London. In addition, ChemCo offers two tickets to a formal high-society dinner in New York and a small desk clock with the ChemCo logo. Schleifer declines to use ChemCo's corporate jet or to allow the firm to pay for his accommodations but accepts the clock and the tickets to the dinner (which he discloses to his employer) since he will be able to market his firm's mutual funds to other guests at the dinner. Has Schleifer violated any CFA Institute Standards of Professional Conduct?
 - A. Yes.
 - B. No, since he is using the gifts accepted to benefit his employer's interests.
 - C. No, since the gifts he accepted were fully disclosed in writing to his employer.
5. Based on the Standards of Professional Conduct, a financial analyst is *least likely* required to:

- A. report to his employer the receipt of gifts and additional compensation from clients.
- B. disclose the value of consideration to be received for referrals.
- C. pay for commercial transportation and lodging while visiting a company's headquarters.

MODULE 42.2: STANDARDS I(C) AND I(D)



Video covering
this content is
available online.

I(C) Misrepresentation. Members and Candidates must not knowingly make any misrepresentations relating to investment analysis, recommendations, actions, or other professional activities.

Guidance

Trust is a foundation in the investment profession. Do not make any misrepresentations or give false impressions. This includes oral, electronic, and social media communications. Misrepresentations include guaranteeing investment performance and plagiarism. Plagiarism encompasses using someone else's work (reports, forecasts, models, ideas, charts, graphs, and spreadsheet models) without giving them credit. Knowingly omitting information that could affect an investment decision or performance evaluation is considered misrepresentation.

Models and analysis developed by others at a member's firm are the property of the firm and can be used without attribution. A report written by another analyst employed by the firm cannot be released as another analyst's work.

Recommended Procedures for Compliance

A good way to avoid misrepresentation is for firms to provide employees who deal with clients or prospects a written list of the firm's available services and a description of the firm's qualifications. Employee qualifications should be accurately presented as well. To avoid plagiarism, maintain records of all materials used to generate reports or other firm products and properly cite sources (quotes and summaries) in work products. Information from recognized financial and statistical reporting services need not be cited.

Members should encourage their firms to establish procedures for verifying marketing claims of third parties whose information the firm provides to clients.

Application of Standard I(C) Misrepresentation

Example 1:

A member makes an error in preparing marketing materials and misstates the amount of assets his firm has under management.

Comment:

The member must attempt to stop distribution of the erroneous material as soon as the error is known. Simply making the error unintentionally is not a violation, but continuing to distribute material known to contain a significant misstatement of fact would be.

Example 2:

The marketing department states in sales literature that an analyst has received an MBA degree, but he has not. The analyst and other members of the firm have distributed this document for years.

Comment:

The analyst has violated the Standards, as he should have known of this misrepresentation after having distributed and used the materials over a period of years.

Example 3:

A member describes an interest-only collateralized mortgage obligation as guaranteed by the U.S. government because it is a claim against the cash flows of a pool of guaranteed mortgages, although the payment stream and the market value of the security are not guaranteed.

Comment:

This is a violation because of the misrepresentation.

Example 4:

A member describes a bank CD as "guaranteed."

Comment:

This is not a violation as long as the limits of the guarantee provided by the Federal Deposit Insurance Corporation are not exceeded and the nature of the guarantee is clearly explained to clients.

Example 5:

A member uses definitions he found online for such terms as variance and coefficient of variation in preparing marketing material.

Comment:

Even though these are standard terms, using the work of others word-for-word is plagiarism.

Example 6:

A candidate reads about a research paper in a financial publication and includes the information in a research report, citing the original research report but not the financial publication.

Comment:

To the extent that the candidate used information and interpretation from the financial publication without citing it, the candidate is in violation of the Standard. The candidate should either obtain the report and reference it directly or, if he relies solely on the financial publication, should cite both sources.

I(D) Misconduct. Members and Candidates must not engage in any professional conduct involving dishonesty, fraud, or deceit or commit any act that reflects adversely on their professional reputation, integrity, or competence.

Guidance

CFA Institute discourages unethical behavior in all aspects of members' and candidates' lives. Do not abuse CFA Institute's Professional Conduct Program by seeking enforcement of this Standard to settle personal, political, or other disputes that are not related to professional ethics.

Recommended Procedures for Compliance

Firms are encouraged to adopt these policies and procedures:

- Develop and adopt a code of ethics and make clear that unethical behavior will not be tolerated.
- Give employees a list of potential violations and sanctions, including dismissal.
- Check references of potential employees.

Application of Standard I(D) Misconduct

Example 1:

A member intentionally includes a receipt that is not in his expenses for a company trip.

Comment:

Because this act involves deceit and fraud and reflects on the member's integrity and honesty, it is a violation.

Example 2:

A member tells a client that he can get her a good deal on a car through his father-in-law, but instead gets her a poor deal and accepts part of the commission on the car purchase.

Comment:

The member has been dishonest and misrepresented the facts of the situation and has, therefore, violated the Standard.



MODULE QUIZ 42.2

1. Jamie Hutchins, CFA, is a portfolio manager for CNV Investments Inc. Over the years, Hutchins has made several poor personal investments that have led to financial distress and personal bankruptcy. Hutchins feels that her business partner, John Smith, is mostly to blame for her situation since "he did not invest enough money in her investment opportunities and caused them to fail." Hutchins reports Smith to CFA Institute claiming Smith violated the Code and Standards relating to misconduct. Which of the following statements is *most likely* correct?
 - A. By reporting Smith to CFA Institute, Hutchins has misused the Professional Conduct Program, thus violating the Code and Standards, but her poor investing and bankruptcy have not violated the Code and Standards.
 - B. Hutchins's bankruptcy reflects poorly on her professional reputation and thus violates the Code and Standards, but her reporting of Smith does not.
 - C. Hutchins's poor investing and bankruptcy, as well as her reporting of Smith, are both violations of the Standards.
2. In which of the following has the analyst *least likely* committed plagiarism?
 - A. Julie Long takes performance projections and charts from a company she is researching, combines them with her own analysis, and publishes them under

- her own name.
- B. Bill Cooper finds a statistical table in the Federal Reserve Bulletin that supports the work he has done in his industry analysis and has his secretary include the table as part of his report without citing the source.
- C. Jan Niedfeldt gets a call from one of her fellow analysts stating that the analyst's research shows that XYZ Company is a buy. Niedfeldt calls up her major clients and tells them that her research shows XYZ is a buy.
3. Jamie Olson, CFA, has just started work as a trainee with Neuvo Management Corp., a small regional money management firm started six months ago. She has been told to make a few cold calls and round up some new clients. In which of the following statements has Olson *least likely* violated the Standards of Practice?
- A. "Sure, we can perform all the financial and investment services you need. We've consistently outperformed the market indexes and will continue to do so under our current management."
- B. "Sure, we can assist you with all the financial and investment services you need. If we don't provide the service in-house, we have arrangements with other full-service firms that I would be happy to tell you about."
- C. "Our firm has a long history of successful performance for our clients. While we can't guarantee future results, we do believe we will continue to benefit our clients."
4. Beth Bixby, CFA, uses a quantitative model to actively manage a portfolio of stocks with an objective of earning a greater return than the market. Over the last three years, the returns to a portfolio constructed using the model have been greater than the returns to the S&P index by between 2% and 4%. In promotional materials, Bixby states: "Through our complex quantitative approach, we select a portfolio that has similar risk to the S&P 500 Index but will receive a return between 2% and 4% greater than the index." This statement is:
- A. permissible since prior returns to the firm's model provide a reasonable and adequate basis for the promotional material.
- B. permissible since the statement describes the basic characteristics of the fund's risk and return objectives.
- C. not permissible since Bixby is misrepresenting the investment performance her firm can reasonably expect to achieve.
5. Josef Karloff, CFA, acts as liaison between Pinnacle Financial (an investment management firm) and Summit Inc. (an investment banking boutique specializing in penny stocks). When Summit underwrites an IPO, Karloff routinely has Pinnacle issue vague statements implying that the firm has cash flows, financial resources, and growth prospects that are better than is the case in reality. This action is a violation of the section of the Standards concerning:
- A. fair dealing.
- B. nonpublic information.
- C. misconduct.

MODULE 42.3: STANDARDS II(A) AND II(B)



Video covering this content is available online.

II Integrity of Capital Markets

II(A) Material Nonpublic Information. Members and Candidates who possess material nonpublic information that could affect the value of an investment must not act or cause others to act on the information.

Guidance

Information is “material” if its disclosure would impact the price of a security or if reasonable investors would want the information before making an investment decision. Ambiguous information, as far as its likely effect on price, may not be considered material. Information is “nonpublic” until it has been made available to the marketplace. An analyst conference call is not public disclosure. Selectively disclosing information by corporations creates the potential for insider-trading violations. The prohibition against acting on material nonpublic information extends to mutual funds containing the subject securities as well as related swaps and options contracts.

Some members and candidates may be involved in transactions during which they receive material nonpublic information provided by firms (e.g., investment banking transactions). Members and candidates may use the provided nonpublic information for its intended purpose, but must not use the information for any other purpose unless it becomes public information.

Guidance—Mosaic Theory

There is no violation when a perceptive analyst reaches an investment conclusion about a corporate action or event through an analysis of public information together with items of nonmaterial nonpublic information.

Guidance—Social Media

When gathering information from internet or social media sources, members and candidates need to be aware that not all of it is considered public information. Members and candidates should confirm that any material information they receive from these sources is also available from public sources, such as company press releases or regulatory filings.

Guidance—Industry Experts

Members and candidates may seek insight from individuals who have specialized expertise in an industry. However, they may not act or cause others to act on any material nonpublic information obtained from these experts until that information has been publicly disseminated.

Recommended Procedures for Compliance

Make reasonable efforts to achieve public dissemination of the information. Encourage firms to adopt procedures to prevent misuse of material nonpublic information. Use a “firewall” within the firm, with elements including:

- Substantial control of relevant interdepartmental communications, through a clearance area such as the compliance or legal department.
- Review employee trades—maintain “watch,” “restricted,” and “rumor” lists.
- Monitor and restrict proprietary trading while a firm is in possession of material nonpublic information.

Prohibition of all proprietary trading while a firm is in possession of material nonpublic information may be inappropriate because it may send a signal to the market. In these cases, firms should take the contra side of only unsolicited customer trades.

Application of Standard II(A) Material Nonpublic Information

Example 1:

A member's dentist, who is an active investor, tells the member that based on his research he believes that Acme, Inc., will be bought out in the near future by a larger firm in the industry. The member investigates and purchases shares of Acme.

Comment:

There is no violation here because the dentist had no inside information but has reached the conclusion on his own. The information here is not material because there is no reason to suspect that an investor would wish to know what the member's dentist thought before investing in shares of Acme.

Example 2:

A member received an advance copy of a stock recommendation that will appear in a widely read national newspaper column the next day and purchases the stock.

Comment:

A recommendation in a widely read newspaper column will likely cause the stock price to rise, so this is material nonpublic information. The member has violated the Standard.

Example 3:

A member trades based on information he gets by seeing an advance copy of an article that will be published in an influential magazine next week.

Comment:

This is a violation as this is nonpublic information until the article has been published.

II(B) Market Manipulation. Members and Candidates must not engage in practices that distort prices or artificially inflate trading volume with the intent to mislead market participants.

Guidance

This Standard applies to transactions that deceive the market by distorting the price-setting mechanism of financial instruments or by securing a controlling position to manipulate the price of a related derivative and/or the asset itself. Spreading false rumors is also prohibited.

Application of Standard II(B) Market Manipulation

Example 1:

A member is seeking to sell a large position in a fairly illiquid stock from a fund he manages. He buys and sells shares of the stock between that fund and another he also manages to create an appearance of activity and stock price appreciation, so that the sale of the whole position will have less market impact and he will realize a better return for the fund's shareholders.

Comment:

The trading activity is meant to mislead market participants and is, therefore, a violation of the Standard. The fact that his fund shareholders gain by this action does not change the fact that it is a violation.

Example 2:

A member posts false information about a firm on internet bulletin boards and stock chat facilities in an attempt to cause the firm's stock to increase in price.

Comment:

This is a violation of the Standard.



MODULE QUIZ 42.3

1. Carrie Carlson, CFA, is a citizen of Emerging Market Country (EMC) with no securities laws governing the use of material nonpublic information. Carlson has clients in Emerging Market Country and in Neighboring Country (NC), which has basic laws governing the use of material nonpublic information. If Carlson has material nonpublic information on a publicly traded security, she:
 - A. can inform her clients in EMC, but may not share material nonpublic information with NC clients.
 - B. can use the information for her NC clients only to the extent permitted by the laws of NC.
 - C. cannot use the information to trade in either EMC or NC.
2. In order to dispel the myth that emerging market stocks are illiquid investments, Green Brothers, a "long only" emerging market fund manager, has two of its subsidiaries simultaneously buy and sell emerging market stocks. In its marketing literature, Green Brothers cites the overall emerging market volume as evidence of the market's liquidity. As a result of its actions, more investors participate in the emerging markets fund. Which of the following is *most likely* correct? Green Brothers:
 - A. did not violate the Code and Standards.
 - B. violated the Code and Standards by manipulating the volume in the emerging securities markets.
 - C. would not have violated the Code and Standards if the subsidiaries only traded stocks not included in the fund.
3. Over the past two days, Lorraine Quigley, CFA, manager of a hedge fund, has been purchasing large quantities of Craeger Industrial Products' common stock while at the same time shorting put options on the same stock. Quigley did not notify her clients of the trades although they are aware of the fund's general strategy to generate returns. Which of the following statements is *most likely* correct? Quigley:
 - A. did not violate the Code and Standards.
 - B. violated the Code and Standards by manipulating the prices of publicly traded securities.
 - C. violated the Code and Standards by failing to disclose the transactions to clients before they occurred.
4. Before joining Mitsui Ltd. as an analyst covering the electrical equipment manufacturing industry, Pam Servais, CFA, worked for Internet Security Systems (ISS) where she had access to nonpublic information. While at ISS, Servais learned of a severe environmental problem at two firms handling boron-based components. It is common knowledge that seven firms in the industry worldwide use the same boron handling technique. The two firms for which Servais has knowledge announced the problem last week and had immediate stock price declines of 11% and 17%, respectively. The other five firms have not made an announcement.

- Servais issues a report recommending Mitsui clients sell shares of the remaining five firms. Servais's issuance of this recommendation:
- A. is not a violation of CFA Institute Standards.
 - B. is a violation of CFA Institute Standards because it fails to distinguish between opinion and fact.
 - C. constitutes a violation of the Standard pertaining to the use of material nonpublic information.
5. Zanuatu, an island nation, does not have any regulations precluding the use of nonpublic information. Alfredo Romero has a friend and fellow CFA charterholder there with whom he has shared nonpublic information regarding firms outside of his industry. The information concerns several firms' internal earnings and cash flow projections. The friend may:
- A. trade on the information only within Zanuatu and only to the extent permitted under the laws of Zanuatu.
 - B. not trade on the information.
 - C. trade on the information only if she can independently develop a reasonable and adequate basis for the transaction using public information.
6. Julia Green, CFA, has friends from her previous employer who have suggested that she receive information from them via an internet chat room. In this way, she receives news about an exciting new product being developed by a firm in Singapore that has the potential to double the firm's revenue. The firm has not revealed any information regarding the product to the public. According to the Code and Standards, this information is:
- A. both material and nonpublic and Green may not trade on it in Singapore, but may trade on it elsewhere.
 - B. both material and nonpublic and Green may not trade on it in any jurisdiction.
 - C. public by virtue of its release in the chat room and Green may trade on it.
7. Will Hunter, CFA, is a portfolio manager at NV Asset Managers in Baltimore, which specializes in managing labor union pension fund accounts. A friend of Hunter's who is an investment banker asks Hunter to purchase shares in their new IPOs in order to support the price long enough for insiders to liquidate their holdings. Hunter realizes that the price of the shares will almost certainly fall dramatically after his buying support ceases. NV management "strongly suggests" that Hunter "not rock the boat" and honor the investment banker's request since NV has had a long-standing relationship with the investment bank. Hunter agrees to make the purchases. Hunter has:
- A. not violated the Code and Standards.
 - B. violated the Code and Standards by attempting to distort prices.
 - C. violated the Code and Standards by failing to place orders in the appropriate transaction priority.

MODULE 42.4: STANDARD III(A)



Video covering
this content is
available online.

III Duties to Clients

III(A) Loyalty, Prudence, and Care. Members and Candidates have a duty of loyalty to their clients and must act with reasonable care and exercise prudent judgment. Members and Candidates must act for the benefit of their clients and place their clients' interests before their employer's or their own interests.

Guidance

Client interests always come first. Although this Standard does not impose a fiduciary duty on members or candidates where one did not already exist, it does

require members and candidates to act in their clients' best interest and recommend products that are suitable given their clients' investment objectives and risk tolerances.

- Exercise the prudence, care, skill, and diligence under the circumstances that a person acting in a like capacity and familiar with such matters would use.
- Manage pools of client assets in accordance with the terms of the governing documents, such as trust documents or investment management agreements.
- Make investment decisions in the context of the total portfolio.
- Inform clients of any limitations in an advisory relationship (e.g., an advisor who may only recommend her own firm's products).
- Vote proxies in an informed and responsible manner. Due to cost benefit considerations, it may not be necessary to vote all proxies.
- Client brokerage, or "soft dollars" or "soft commissions" must be used to benefit the client.
- The "client" may be the investing public as a whole rather than a specific entity or person.

Recommended Procedures of Compliance

Submit to clients, at least quarterly, itemized statements showing all securities in custody and all debits, credits, and transactions.

Encourage firms to address these topics when drafting policies and procedures regarding fiduciary duty:

- Follow applicable rules and laws.
- Establish investment objectives of client. Consider suitability of portfolio relative to client's needs and circumstances, the investment's basic characteristics, or the basic characteristics of the total portfolio.
- Diversify.
- Deal fairly with all clients in regards to investment actions.
- Disclose conflicts.
- Disclose compensation arrangements.
- Vote proxies in the best interest of clients and ultimate beneficiaries.
- Maintain confidentiality.
- Seek best execution.
- Place client interests first.

Application of Standard III(A) Loyalty, Prudence, and Care

Example 1:

A member uses a broker for client-account trades that has relatively high prices and average research and execution. In return, the broker pays for the rent and other overhead expenses for the member's firm.

Comment:

This is a violation of the Standard because the member used client brokerage for services that do not benefit clients and failed to get the best price and execution for his clients.

Example 2:

In return for receiving account management business from Broker X, a member directs trades to Broker X on the accounts referred to her by Broker X, as well as on other accounts as an incentive to Broker X to send her more account business.

Comment:

This is a violation if Broker X does not offer the best price and execution or if the practice of directing trades to Broker X is not disclosed to clients. The obligation to seek best price and execution is always required unless clients provide a written statement that the member is not to seek best price and execution and that they are aware of the impact of this decision on their accounts.

Example 3:

A member does more trades in client accounts than are necessary to accomplish client goals because she desires to increase her commission income.

Comment:

The member is using client assets (brokerage fees) to benefit herself and has violated the Standard.



MODULE QUIZ 42.4

1. Mary Herbst, CFA, a pension fund manager at GBH Investments, is reviewing some of FreeTime, Inc.'s pension fund activities over the past years. Which of the following actions related to FreeTime, Inc.'s pension fund is *most likely* to be a breach of her fiduciary duties?
 - A. Paying higher-than-average brokerage fees to obtain research materials used in the management of the pension fund.
 - B. Trading with selected brokers so that the brokers will recommend GBH's managers to potential clients.
 - C. Selectively choosing brokers for the quality of research provided for managing FreeTime's pension.

MODULE 42.5: STANDARDS III(B) AND III(C)



Video covering this content is available online.

III(B) Fair Dealing. Members and Candidates must deal fairly and objectively with all clients when providing investment analysis, making investment recommendations, taking investment action, or engaging in other professional activities.

Guidance

Do not discriminate against any clients when disseminating recommendations or taking investment action. Fairly does not mean equally. In the normal course of business, there will be differences in the time emails, faxes, etc., are received by

different clients. Different service levels are okay, but they must not negatively affect or disadvantage any clients. Disclose the different service levels to all clients and prospects, and make premium levels of service available to all who wish to pay for them.

Guidance—Investment Recommendations

Give all clients a fair opportunity to act upon every recommendation. Clients who are unaware of a change in a recommendation should be advised before the order is accepted.

Guidance—Investment Actions

Treat clients fairly in light of their investment objectives and circumstances. Treat both individual and institutional clients in a fair and impartial manner. Members and candidates should not take advantage of their position in the industry to disadvantage clients (e.g., in the context of IPOs).

Recommended Procedures for Compliance

Encourage firms to establish compliance procedures requiring proper dissemination of investment recommendations and fair treatment of all customers and clients. Consider these points when establishing fair dealing compliance procedures:

- Limit the number of people who are aware that a change in recommendation will be made.
- Shorten the time frame between decision and dissemination.
- Publish personnel guidelines for pre-dissemination—have in place guidelines prohibiting personnel who have prior knowledge of a recommendation from discussing it or taking action on the pending recommendation.
- Simultaneous dissemination of new or changed recommendations to all clients who have expressed an interest or for whom an investment is suitable.
- Maintain list of clients and holdings—use to ensure that all holders are treated fairly.
- Develop written trade allocation procedures—ensure fairness to clients, timely and efficient order execution, and accuracy of client positions.
- Disclose trade allocation procedures.
- Establish systematic account review—ensure that no client is given preferred treatment and that investment actions are consistent with the account's objectives.
- Disclose available levels of service.

Application of Standard III(B) Fair Dealing

Example 1:

A member gets options for his part in an IPO from the subject firm. The IPO is oversubscribed and the member fills his own and other individuals' orders but has to reduce allocations to his institutional clients.

Comment:

The member has violated the Standard. He must disclose to his employer and to his clients that he has accepted options for putting together the IPO. He should not take any shares of a hot IPO for himself and should have distributed his allocated shares of the IPO to all clients in proportion to their original order amounts.

Example 2:

A member is delayed in allocating some trades to client accounts. When she allocates the trades, she puts some positions that have appreciated in a preferred client's account and puts trades that have not done as well in other client accounts.

Comment:

This is a violation of the Standard. The member should have allocated the trades to specific accounts prior to the trades or should have allocated the trades proportionally to suitable accounts in a timely fashion.

Example 3:

Because of minimum lot size restrictions, a portfolio manager allocates the bonds she receives from an oversubscribed bond offering to her clients in a way that is not strictly proportional to their purchase requests.

Comment:

Since she has a reason (minimum lot size) to deviate from a strict pro rata allocation to her clients, there is no violation of Fair Dealing.

III(C) Suitability

1. When Members and Candidates are in an advisory relationship with a client, they must:
 - a. Make a reasonable inquiry into a client's or prospective clients' investment experience, risk and return objectives, and financial constraints prior to making any investment recommendation or taking investment action and must reassess and update this information regularly.
 - b. Determine that an investment is suitable to the client's financial situation and consistent with the client's written objectives, mandates, and constraints before making an investment recommendation or taking investment action.
 - c. Judge the suitability of investments in the context of the client's total portfolio.
2. When Members and Candidates are responsible for managing a portfolio to a specific mandate, strategy, or style, they must make only investment recommendations or take only investment actions that are consistent with the stated objectives and constraints of the portfolio.

Guidance

In advisory relationships, be sure to gather client information at the beginning of the relationship, in the form of an investment policy statement (IPS). Consider clients' needs and circumstances and thus their risk tolerance. Consider whether or not the use of leverage is suitable for the client.

If a member is responsible for managing a fund to an index or other stated mandate, be sure investments are consistent with the stated mandate.

Guidance—Unsolicited Trade Requests

An investment manager might receive a client request to purchase a security that the manager knows is unsuitable, given the client's investment policy statement. The trade may or may not have a material effect on the risk characteristics of the client's total portfolio and the requirements are different for each case. In either case, however, the manager should not make the trade until he has discussed with the client the reasons (based on the IPS) that the trade is unsuitable for the client's account.

If the manager determines that the effect on the risk/return profile of the client's total portfolio is minimal, the manager, after discussing with the client how the trade does not fit the IPS goals and constraints, may follow his firm's policy with regard to unsuitable trades. Regardless of firm policy, the client must acknowledge the discussion and an understanding of why the trade is unsuitable.

If the trade would have a material impact on the risk/return profile of the client's total portfolio, one option is to update the IPS so that the client accepts a changed risk profile that would permit the trade. If the client will not accept a changed IPS, the manager may follow firm policy, which may allow the trade to be made in a separate client-directed account. In the absence of other options, the manager may need to reconsider whether to maintain the relationship with the client.

Recommended Procedures for Compliance

Members should:

- Put the needs and circumstances of each client and the client's investment objectives into a written IPS for each client.
- Consider the type of client and whether there are separate beneficiaries, investor objectives (return and risk), investor constraints (liquidity needs, expected cash flows, time, tax, and regulatory and legal circumstances), and performance measurement benchmarks.
- Review investor's objectives and constraints periodically to reflect any changes in client circumstances.

Application of Standard III(C) Suitability

Comment:

Example 1:

A member gives a client account a significant allocation to non-dividend paying high-risk securities even though the client has low risk tolerance and modest return objectives.

Comment:

This is a violation of the Standard.

Example 2:

A member puts a security into a fund she manages that does not fit the mandate of the fund and is not a permitted investment according to the fund's disclosures.

Comment:

This, too, is a violation of the Standard.

Example 3:

A member starts his own money management business but puts all clients in his friend's hedge funds.

Comment:

He has violated the Standards with respect to suitability. He must match client needs and circumstances to the investments he recommends and cannot act like a sales agent for his friend's funds.



MODULE QUIZ 42.5

1. Melvin Byrne, CFA, manages a portfolio for James Martin, a very wealthy client. Martin's portfolio is well diversified with a slight tilt toward capital appreciation. Martin requires very little income from the portfolio. Recently, Martin's brother, Cliff, has become a client of Byrne. Byrne proceeds to invest Cliff's portfolio in a similar manner to James's portfolio based on the fact that both brothers have a similar lifestyle and are only two years apart in age. Which of the following statements is *most accurate*? Byrne violated the Code and Standards by:
 - A. knowingly creating a conflict between the interests of James's and Cliff's portfolios.
 - B. failing to determine Cliff's objectives and constraints prior to investing his portfolio.
 - C. failing to have a reasonable and adequate basis for Cliff's portfolio allocation.
2. Jessica Ellis, CFA, manages an international stock fund for a group of wealthy investors with similar investment objectives. According to the investment policy statement, the fund is to pursue an aggressive growth strategy while maintaining sufficient international diversification and is prohibited from using leverage. Ellis has just received a request from the majority of the group of investors to purchase for the fund a large position in German bonds which they believe to be significantly undervalued. Which of the following actions should Ellis take to avoid violating the Code and Standards?
 - A. Purchase the bonds since it was requested by the clients to whom Ellis has a fiduciary duty.
 - B. Inform the investors that she is unable to make the purchase since it is inconsistent with the international stock portfolio's investment mandate.
 - C. Purchase the bonds only after receiving a written consent statement signed by the majority of the investors stating that they are aware that the investment is not suitable for the portfolio.
3. Shane Matthews, CFA, is a principal at Carlson Brothers, a leading regional investment bank specializing in initial public offerings of small to mid-sized biotech firms. Just before many of the IPOs are offered to the general public, Matthews arranges for 10% of the shares of the firm going public to be distributed to select Carlson clients. This action is *most likely* a violation of the Standard concerning:
 - A. additional compensation.
 - B. disclosure of conflicts of interest.
 - C. fair dealing.

MODULE 42.6: STANDARDS III(D) AND III(E)



Video covering this content is available online.

III(D) Performance Presentation. When communicating investment performance information, Members or Candidates must make reasonable efforts to ensure that it is fair, accurate, and complete.

Guidance

Members must avoid misstating performance or misleading clients/prospects about investment performance of themselves or their firms, should not misrepresent past performance or reasonably expected performance, and should not state or imply the ability to achieve a rate of return similar to that achieved in the past. For brief presentations, members must make detailed information available on request and indicate that the presentation has offered limited information.

Recommended Procedures for Compliance

Encourage firms to adhere to Global Investment Performance Standards. Obligations under this Standard may also be met by:

- Considering the sophistication of the audience to whom a performance presentation is addressed.
- Presenting performance of weighted composite of similar portfolios rather than a single account.
- Including terminated accounts as part of historical performance and clearly stating when they were terminated.
- Including all appropriate disclosures to fully explain results (e.g., model results included, gross or net of fees, etc.).
- Maintaining data and records used to calculate the performance being presented.

Application of Standard III(D) Performance Presentation

Example 1:

A member puts simulated results of an investment strategy in a sales brochure without disclosing that the results are not actual performance numbers.

Comment:

The member has violated the Standard.

Example 2:

In materials for prospective clients, a member uses performance figures for a large-cap growth composite she has created by choosing accounts that have done relatively well and including some accounts with significant mid-cap exposure.

Comment:

This is a violation of the Standard as the member has attempted to mislead clients and has misrepresented her performance.

Example 3:

A member changes his firm's performance attribution method to one he believes is more consistent with the strategies used by the firm's investment managers.

Comment:

To avoid a violation of the Standard, the member must disclose this change to existing and new clients. He should explain the reasons for changing the method and report the managers' performance attribution using *both* the old and new methods so that clients may compare them.

III(E) Preservation of Confidentiality. Members and Candidates must keep information about current, former, and prospective clients confidential unless:

1. The information concerns illegal activities on the part of the client or prospective client,
2. Disclosure is required by law, or
3. The client or prospective client permits disclosure of the information.

Guidance

If illegal activities by a client are involved, members may have an obligation to report the activities to authorities. The confidentiality Standard extends to former clients as well.

The requirements of this Standard are not intended to prevent Members and Candidates from cooperating with a CFA Institute Professional Conduct Program (PCP) investigation.

Recommended Procedures for Compliance

Members should avoid disclosing information received from a client except to authorized co-workers who are also working for the client. Members should follow firm procedures for storage of electronic data and recommend adoption of such procedures if they are not in place.

Application of Standard III(E) Preservation of Confidentiality

Example 1:

A member has learned from his client that one of his goals is to give more of his portfolio income to charity. The member tells this to a friend who is on the board of a worthy charity and suggests that he should contact the client about a donation.

Comment:

The member has violated the Standard by disclosing information he has learned from the client in the course of their business relationship.

Example 2:

A member learns that a pension account client is violating the law with respect to charges to the pension fund.

Comment:

The member must bring this to the attention of her supervisor and try to end the illegal activity. Failing this, the member should seek legal advice about any disclosure she should make to legal or regulatory authorities and dissociate herself from any continuing association with the pension account.



MODULE QUIZ 42.6

1. In a marketing brochure, DNR Asset Managers presents the performance of several composite portfolios managed according to similar investment strategies. In constructing composites, the firm excludes individual portfolios with less than \$1 million in assets, excludes terminated portfolios, and includes simulated results. DNR includes the following disclosure in the brochure: "Past performance is no guarantee of future results. Composites exclude portfolios under \$1 million in assets and include results from simulated model portfolios with similar strategies." DNR's brochure:
 - A. does not violate the Code and Standards.
 - B. violates the Code and Standards by failing to include terminated portfolios in the performance presentation.
 - C. violates the Code and Standards by excluding portfolios under \$1 million from the composite performance presentation.
2. Beth Anderson, CFA, is a portfolio manager for several wealthy clients including Reuben Carlyle. Anderson manages Carlyle's personal portfolio of stock and bond investments. Carlyle recently told Anderson that he is under investigation by the IRS for tax evasion related to his business, Carlyle Concrete (CC). After learning about the investigation, Anderson proceeds to inform a friend at a local investment bank so that they may withdraw their proposal to take CC public. Which of the following is *most likely* correct? Anderson:
 - A. violated the Code and Standards by failing to maintain the confidentiality of her client's information.
 - B. violated the Code and Standards by failing to detect and report the tax evasion to the proper authorities.
 - C. did not violate the Code and Standards since the information she conveyed pertained to illegal activities on the part of her client.
3. Which of the following is *least likely* one of the recommendations included in the Standards of Practice Handbook with regard to performance presentation?
 - A. Include terminated accounts in past performance history.
 - B. Present the performance of a representative account to show how a composite has performed.
 - C. Consider the level of financial knowledge of the audience to whom the performance is presented.

MODULE 42.7: STANDARDS IV(A), IV(B), AND IV(C)



Video covering this content is available online.

IV Duties to Employers

IV(A) Loyalty. In matters related to their employment, Members and Candidates must act for the benefit of their employer and not deprive their employer of the advantage of their skills and abilities, divulge confidential information, or otherwise cause harm to their employer.

Guidance

Members must not engage in any activities which would injure the firm, deprive it of profit, or deprive it of the advantage of employees' skills and abilities. Members should always place client interests above interests of their employer but consider the effects of their actions on firm integrity and sustainability. There is no requirement that the employee put employer interests ahead of family and other personal obligations; it is expected that employers and employees will discuss such matters and balance these obligations with work obligations.

Guidance—Employer Responsibility

Members are encouraged to give their employer a copy of the Code and Standards. Employers should not have incentive and compensation systems that encourage unethical behavior.

Guidance—Independent Practice

Independent practice for compensation is allowed if a notification is provided to the employer fully describing all aspects of the services, including compensation, duration, and the nature of the activities *and* if the employer consents to all terms of the proposed independent practice before it begins.

Guidance—Leaving an Employer

Members must continue to act in their employer's best interests until resignation is effective. Activities which may constitute a violation include:

- Misappropriation of trade secrets.
- Misuse of confidential information.
- Soliciting employer's clients prior to leaving.
- Self-dealing.
- Misappropriation of client lists.

Employer records on any medium (e.g., home computer, PDA, cell phone) are the property of the firm.

Once an employee has left a firm, simple knowledge of names and existence of former clients is generally not confidential. There is also no prohibition on the use of experience or knowledge gained while with a former employer. If an agreement exists among employers (e.g., the U.S. "Protocol for Broker Recruiting") that permits brokers to take certain client information when leaving a firm, a member or candidate may act within the terms of the agreement without violating the Standard.

Guidance—Social Media

Members and candidates must adhere to their employers' policies concerning social media. When planning to leave an employer, members and candidates must ensure that their social media use complies with their employers' policies for notifying clients about employee separations. A best practice is to use separate social media accounts for personal and professional communications.

Guidance—Whistleblowing

There may be isolated cases where a duty to one's employer may be violated in order to protect clients or the integrity of the market, and not for personal gain.

Guidance—Nature of Employment

The applicability of this Standard is based on the nature of the employment—employee versus independent contractor. If Members and Candidates are independent contractors, they still have a duty to abide by the terms of the agreement.

Application of Standard IV(A) Loyalty

Example 1:

A member solicits clients and prospects of his current employer to open accounts at the new firm he will be joining shortly.

Comment:

It is a violation of the Standard to solicit the firm's clients and prospects while he is still employed by the firm.

Example 2:

Two employees discuss joining with others in an employee-led buyout of their employer's emerging markets investment management business.

Comment:

There is no violation here. Their employer can decide how to respond to any buyout offer. If such a buyout takes place, clients should be informed of the nature of the changes in a timely manner.

Example 3:

A member is writing a research report on a company as a contract worker for Employer A (using Employer A's premises and materials) with the understanding that Employer A does not claim exclusive rights to the outcome of her research. As she is finishing the report, she is offered a full-time job by Employer B and sends Employer B a copy of a draft of her report for publication.

Comment:

She has violated the Standard by not giving Employer A the first rights to act on her research. She must also be careful not to take any materials used in preparing the report from Employer A's premises.

Example 4:

A member helps develop software for a firm while acting as an unpaid intern and takes the software, without permission, with her when she takes a full-time job at another firm.

Comment:

She is considered an employee of the firm and has violated the Standard by taking her employer's property without permission.

Example 5:

A member prepares to leave his employer and open his own firm by registering with the SEC, renting an office, and buying office equipment.

Comment:

As long as these preparations have not interfered with the performance of his current job, there has been no violation. The solicitation of firm clients and prospects prior to leaving his employer would, however, be a violation of the Standard.

Example 6:

A member is a full-time employee of an investment management firm and wants to accept a paid position as town mayor without asking his employer's permission.

Comment:

Because the member serving as mayor does not conflict with his employer's business interests, as long as the time commitment does not preclude performing his expected job functions well, there is no violation.

Example 7:

A member who has left one employer uses public sources to get the phone numbers of previous clients and solicits their business for her new employer.

Comment:

As long as there is no agreement in force between the member and his previous employer that prohibits such solicitation, there is no violation of the Standards.

IV(B) Additional Compensation Arrangements. Members and Candidates must not accept gifts, benefits, compensation, or consideration that competes with or might reasonably be expected to create a conflict of interest with their employer's interest unless they obtain written consent from all parties involved.

Guidance

Compensation includes direct and indirect compensation from a client and other benefits received from third parties. Written consent from a member's employer includes email communication. Members and candidates who are hired to work part time should discuss any arrangements that may compete with their employer's interest at the time they are hired, and abide by any limitations their employer identifies.

Recommended Procedures for Compliance

Make an immediate written report to employer detailing any proposed compensation and services, if additional to that provided by employer. Details including any performance incentives should be verified by the offering party.

Application of Standard IV(B) Additional Compensation Arrangements**Example 1:**

A member is on the board of directors of a company whose shares he purchases for client accounts. As a member of the board, he receives the company's product at no

charge.

Comment:

Because receiving the company's product constitutes compensation for his service, he is in violation of the Standard if he does not disclose this additional compensation to his employer.



PROFESSOR'S NOTE

If a client gives us money for doing a good job (one time), we need to disclose it (though not necessarily in writing).

If we have an agreement with a client that we will receive money in the future for outperformance, we need to disclose that in writing.

For any side job that potentially competes with our employer, written permission is required.

For a side job (e.g., bartender) that's unrelated to our primary job, no disclosure is required.

IV(C) Responsibilities of Supervisors. Members and Candidates must make reasonable efforts to ensure that anyone subject to their supervision or authority complies with applicable laws, rules, regulations, and the Code and Standards.

Guidance

Members must make reasonable efforts to *prevent* employees from violating laws, rules, regulations, or the Code and Standards, as well as make reasonable efforts to *detect* violations.

Guidance—Compliance Procedures

Understand that an adequate compliance system must meet industry standards, regulatory requirements, and the requirements of the Code and Standards. Members with supervisory responsibilities have an obligation to bring an inadequate compliance system to the attention of firm's management and recommend corrective action. While investigating a possible breach of compliance procedures, it is appropriate to limit the suspected employee's activities.

A member or candidate faced with no compliance procedures or with procedures he believes are inadequate must decline supervisory responsibility in writing until adequate procedures are adopted by the firm.

Recommended Procedures for Compliance

A member should recommend that his employer adopt a code of ethics. Employers should not commingle compliance procedures with the firm's code of ethics—this can dilute the goal of reinforcing one's ethical obligations. Members should encourage employers to provide their code of ethics to clients.

Adequate compliance procedures should:

- Be clearly written.
- Be easy to understand.

- Designate a compliance officer with authority clearly defined.
- Have a system of checks and balances.
- Outline the scope of procedures.
- Outline what conduct is permitted.
- Contain procedures for reporting violations and sanctions.
- Structure incentives so that unethical behavior is not rewarded.

Once the compliance program is instituted, the supervisor should:

- Distribute it to the proper personnel.
- Update it as needed.
- Continually educate staff regarding procedures.
- Issue reminders as necessary.
- Require professional conduct evaluations.
- Review employee actions to monitor compliance and identify violations.
- Enforce procedures once a violation occurs.
- Review procedures and identify any changes needed to prevent violations in the future.

If there is a violation, respond promptly and conduct a thorough investigation while increasing supervision or placing limitations on the wrongdoer's activities.

Application of Standard IV(C) Responsibilities of Supervisors

Example 1:

A member responsible for compliance by the firm's trading desk notices a high level of trading activity in a stock that is not on the firm's recommended list. Most of this trading is being done by a trainee, and the member does not investigate this trading.

Comment:

This is a violation of the member's responsibilities as supervisor. She must take steps to monitor the activities of traders in training, as well as investigate the reason for the heavy trading of the security by her firm's trading desk.



MODULE QUIZ 42.7

1. Connie Fletcher, CFA, works for a small money management firm that specializes in pension accounts. Recently, a friend asked her to act as an unpaid volunteer manager for the city's street sweep pension fund. As part of the position, the city would grant Fletcher a free parking space in front of her downtown office. Fletcher is considering the offer. Fletcher is *most likely* required by CFA Institute Standards to:
 - A. decline the offer because it might create a conflict of interest with her employer's interest.
 - B. inform her current clients in writing and discuss the offer with her employer before accepting the offer.
 - C. obtain written permission from her employer before accepting the offer.
2. Which of the following statements about a supervisor's responsibilities is *most accurate*?

- A. If her employer has an inadequate compliance system, a member or candidate should refuse to accept supervisory responsibility until the firm develops plans to adopt reasonable procedures in the future.
 - B. In the event of misconduct by an employee that they oversee, a member or candidate can fulfill their supervisory responsibilities by reporting the misconduct up the chain of command and warning the employee to cease the activity.
 - C. Members and candidates with oversight responsibilities for large numbers of employees may delegate supervisory duties to subordinates who directly oversee these employees.
3. Robert Blair, CFA, Director of Research, has had an ongoing battle with management about the adequacy of the firm's compliance system. Recently, it has come to Blair's attention that the firm's compliance procedures are inadequate in that they are not being monitored and not carefully followed. What should Blair *most appropriately* do?
- A. Resign from the firm unless the compliance system is strengthened and followed.
 - B. Send his superior a memo outlining the problem.
 - C. Decline in writing to continue to accept supervisory responsibility until reasonable compliance procedures are adopted.
4. Ahmed Jamal, CFA, head of research for Valley Brokers, decided it was time to change his recommendation on D&R Company from buy to sell. He orally announced his decision during the Monday staff meeting and said his written report would be finished and disseminated to Valley's customers by the middle of next week. As a result of this announcement, Doris Smith, one of Jamal's subordinates, immediately sold her personal shares in D&R, and Martin Temple told his largest institutional customers of the change the following day. Which Standards have *most likely* been violated?
- A. Jamal violated Standard IV(C) Responsibilities of Supervisors; Smith violated Standard II(A) Material Nonpublic Information; and Temple violated Standard VI(B) Priority of Transactions.
 - B. Jamal violated Standard IV(C) Responsibilities of Supervisors; Smith violated Standard VI(B) Priority of Transactions; and Temple violated Standard III(B) Fair Dealing.
 - C. Smith violated Standard VI(B) Priority of Transactions, and Temple violated Standard III(B) Fair Dealing.
5. Sally Albright, CFA, works full-time for Frank & Company, an investment management firm, as a fixed-income security analyst. Albright has been asked by a business contact at KDG Enterprises to accept some analytical work from KDG on a consulting basis. The work would entail investigating potential distressed debt securities in the small-cap market. Albright should *most appropriately*:
- A. accept the work as long as she obtains consent to all the terms of the engagement from Frank & Company.
 - B. not accept the work as it violates the Code and Standards by creating a conflict of interest.
 - C. accept the work as long as she obtains written consent from KDG and does it on her own time.

MODULE 42.8: STANDARD V



Video covering
this content is
available online.

V Investment Analysis, Recommendations, and Actions

V(A) Diligence and Reasonable Basis. Members and Candidates must:

- Exercise diligence, independence, and thoroughness in analyzing investments, making investment recommendations, and taking investment actions.
- Have a reasonable and adequate basis, supported by appropriate research and investigation, for any investment analysis, recommendation, or action.

Guidance

The application of this Standard depends on the investment philosophy adhered to, members' and candidates' roles in the investment decision-making process, and the resources and support provided by employers. These factors dictate the degree of diligence, thoroughness of research, and the proper level of investigation required.

Guidance—Reasonable Basis

The level of research required to satisfy the requirement for due diligence will differ depending on the product or service offered. A list of some things that should be considered prior to making a recommendation or taking investment action includes:

- Global and national economic conditions.
- A firm's financial results, operating history, and business cycle stage.
- Fees and historical results for a mutual fund.
- Limitations of any quantitative models used.
- A determination of whether peer group comparisons for valuation are appropriate.

Guidance—Using Secondary or Third-Party Research

Members should encourage their firms to adopt a policy for periodic review of the quality of third-party research, if they have not. Examples of criteria to use in judging quality are:

- Review assumptions used.
- Determine how rigorous the analysis was.
- Identify how timely the research is.
- Evaluate objectivity and independence of the recommendations.

Guidance—Using Quantitative Research

Members must be able to explain the basic nature of the quantitative research and how it is used to make investment decisions. Members should consider scenarios outside those typically used to assess downside risk and the time horizon of the data used for model evaluation to ensure that both positive and negative cycle results have been considered.

Guidance—Developing Quantitative Techniques

The Standard requires greater diligence of members and candidates who create quantitative techniques than of those who use techniques developed by others. Members and candidates must understand the technical details of the products they offer to clients. A member or candidate who has created a quantitative strategy must test it thoroughly, including extreme scenarios with inputs that fall outside the range of historical data, before offering it to clients.

Guidance—External Advisers

Members should make sure their firms have procedures in place to review any external advisers they use or promote to ensure that, among other things, the advisers:

- Have adequate compliance and internal controls.
- Present returns information that is correct.
- Do not deviate from their stated strategies.

Guidance—Group Research and Decision Making

Even if a member does not agree with the independent and objective view of the group, he does not necessarily have to decline to be identified with the report, as long as there is a reasonable and adequate basis.

Recommended Procedures for Compliance

Members should encourage their firms to consider these policies and procedures supporting this Standard:

- Have a policy requiring that research reports and recommendations have a basis that can be substantiated as reasonable and adequate.
- Have detailed, written guidance for proper research and due diligence.
- Have measurable criteria for judging the quality of research, and base analyst compensation on such criteria.
- Have written procedures that provide a minimum acceptable level of scenario testing for computer-based models and include standards for the range of scenarios, model accuracy over time, and a measure of the sensitivity of cash flows to model assumptions and inputs.
- Have a policy for evaluating outside providers of information that addresses the reasonableness and accuracy of the information provided and establishes how often the evaluations should be repeated.
- Adopt a set of standards that provides criteria for evaluating external advisers and states how often a review of external advisers will be performed.

Application of Standard V(A) Diligence and Reasonable Basis

Example 1:

Ben Strong, CFA, works in the investment banking department of Martellus, Ltd. The firm is anticipating that the green energy credits enjoyed by some of the firms will shrink. Because the demand for this tax-advantaged category is currently high, Strong convinces several companies that they should undertake new equity financings promptly before the credit shrinks. Strong, however, has limited bandwidth and is unable to provide the due diligence necessary to accurately price these issues. Strong decides to simply apply a multiple to the current level of credits these firms receive, and plans to dive deeper once the workload becomes manageable.

Comment:

Strong should only accept the work that he and his department can handle. By using an ad-hoc multiple, Strong has neglected to research all the other relevant aspects that should be considered when pricing new issues, and thus has not performed sufficient due diligence. This lack of basis could result in shares being priced incorrectly.

Example 2:

A member in the corporate finance department of a securities firm prices IPO shares without doing adequate research because she wants to get them to market quickly.

Comment:

This is a violation of Standard V(A).

Example 3:

A member screens a database of investment managers and sends a recommendation of five of them to a client. Subsequently, but before the client receives the report, one of the recommended firms loses its head of research and several key portfolio managers. The member does not update her report.

Comment:

This is a violation as the member should have notified the client of the change in key personnel at the management firm.

Example 4:

A member writes a report in which she estimates mortgage rates. After reviewing it, a majority of the investment committee vote to change the report to reflect a different interest rate forecast. Must the member dissociate herself from the report?

Comment:

The same facts may give rise to different opinions and as long as the committee has a reasonable and adequate basis for their (differing) opinion, the member is under no obligation to ask that her name be removed from the report or to disassociate from issuing the report.

Example 5:

A member makes a presentation for an offering his firm is underwriting, using maximum production levels as his estimate in order to justify the price of the shares he is recommending for purchase.

Comment:

Using the maximum possible production without acknowledging that this is not the expected level of production (or without presenting a range of possible outcomes and their relative probabilities) does not provide a reasonable basis for the purchase recommendation and is a violation of the Standard.

Example 6:

A member posts buy recommendations in an internet chat room based on "conventional wisdom" and what the public is currently buying.

Comment:

A recommendation that is not based on independent and diligent research into the subject company is a violation of the Standard.

Example 7:

A member is a principal in a small investment firm that bases its securities recommendations on third-party research that it purchases.

Comment:

This is not a violation as long as the member's firm periodically checks the purchased research to determine that it has met, and still meets, the criteria of objectivity and reasonableness required by the Standard.

Example 8:

A member selects an outside advisor for international equities based solely on the fact that the selected firm has the lowest fees for managing the international equities accounts.

Comment:

This is a violation of Standard V(A). The member must consider performance and service, not just fees, in selecting an outside advisor for client accounts.

Example 9:

A member investigates the management, fees, track record, and investment strategy of a hedge fund and recommends it to a client who purchases it. The member accurately discloses the risks involved with the investment in the hedge fund. Soon afterward, the fund reports terrible losses and suspends operations.

Comment:

The bad outcome does not mean there has necessarily been a violation of Standard V(A). A member who has performed reasonable due diligence and disclosed investment risks adequately has complied with the requirements of Standard V(A), regardless of the subsequent outcome.

V(B) Communication with Clients and Prospective Clients. Members and Candidates must:

1. Disclose to clients and prospective clients the basic format and general principles of the investment processes they use to analyze investments, select securities, and construct portfolios and must promptly disclose any changes that might materially affect those processes.
2. Disclose to clients and prospective clients significant limitations and risks associated with the investment process.
3. Use reasonable judgment in identifying which factors are important to their investment analyses, recommendations, or actions and include those factors in communications with clients and prospective clients.
4. Distinguish between fact and opinion in the presentation of investment analysis and recommendations.

Guidance

Proper communication with clients is critical to provide quality financial services. Members must distinguish between opinions and facts and always include the basic characteristics of the security being analyzed in a research report.

Members must illustrate to clients and prospects the investment decision-making process utilized.

All means of communication are included here, not just research reports.

In preparing recommendations for structured securities, allocation strategies, or any other nontraditional investment, members should communicate those risk factors specific to such investments. In all cases, members should communicate the potential gains and losses on the investment clearly in terms of total returns. Members are required to communicate significant changes in the risk characteristics of an investment or strategy and to update clients regularly about changes in the investment process, including any risks and limitations that have been newly identified.

When using projections from quantitative models and analysis, members may violate the Standard by not explaining the limitations of the model and the assumptions it uses, which provides a context for judging the uncertainty regarding the estimated investment result.

Members and candidates must inform clients about limitations inherent to an investment. Two examples of such limitations are liquidity and capacity. *Liquidity* refers to the ability to exit an investment readily without experiencing a significant extra cost for doing so. *Capacity* refers to an investment vehicle's ability to absorb additional investment without reducing the returns it is able to achieve.

Recommended Procedures for Compliance

Selection of relevant factors in a report can be a judgment call, so be sure to maintain records indicating the nature of the research, and be able to supply additional information if it is requested by the client or other users of the report.

Application of Standard V(B) Communication with Clients and Prospective Clients

Example 1:

A member sends a report to his investment management firm's clients describing a strategy his firm offers in terms of the high returns it will generate in the event interest rate volatility decreases. The report does not provide details of the strategy because they are deemed proprietary. The report does not consider the possible returns if interest rate volatility actually increases.

Comment:

This is a violation on two counts. The basic nature of the strategy must be disclosed, including the extent to which leverage is used to generate the high returns when volatility falls. Further, the report must include how the strategy will perform if volatility rises, as well as if it falls.

Example 2:

A member's firm changes from its old equity selection model, which is based on price-sales ratios, to a new model based on several factors, including future earnings growth rates, but does not inform clients of this change.

Comment:

This is a violation because members must inform their clients of any significant change in their investment process. Here, the introduction of forecast data on earnings growth can be viewed as a significant change because the old single-variable model was based on reported rather than forecast data.

Example 3:

A member's firm, in response to poor results relative to its stated benchmark, decides to structure portfolios to passively track the benchmark and does not inform clients.

Comment:

This is a significant change in the investment process and must be communicated to clients.

Example 4:

At a firm where individual portfolio managers have been responsible for security selection, a new policy is implemented whereby only stocks on an approved list constructed by the firm's senior managers may be purchased in client accounts. A member who is a portfolio manager does not inform his clients.

Comment:

This is a violation of the Standard because it represents a significant change in the investment process.

Example 5:

A member changes his firm's outside manager of real estate investments and provides information of this change only in the firm's annual report where outside advisers are listed.

Comment:

This is a violation of the Standard. The member should notify clients immediately of such a change in the firm's investment process.

Example 6:

A member discovers that an error in one of his firm's quantitative models led to a number of trades in one portfolio that should not have been made. The member corrects the error in the model and rebalances the portfolio to reverse the erroneous trades, but does not report the issue.

Comment:

The member violated the Standard by failing to disclose both the error and the corrective action to clients.



PROFESSOR'S NOTE

Remember, the argument that clients “won’t care” about a process change can be turned around to “there’s no reason not to disclose the change.”

V(C) Record Retention. Members and Candidates must develop and maintain appropriate records to support their investment analysis, recommendations, actions, and other investment-related communications with clients and prospective clients.

Guidance

Members must maintain research records that support the reasons for the analyst’s conclusions and any investment actions taken. Such records are the property of the firm. If no other regulatory standards or firm policies are in place, the Standard recommends a 7-year minimum holding period. All communications with clients through any medium, including emails and text messages, are records that must be retained.

A member who changes firms must recreate the analysis documentation supporting her recommendation using publicly available information or information obtained from the company and must not rely on memory or materials created at her previous firm.

Recommended Procedures for Compliance

This recordkeeping requirement generally is the firm’s responsibility.

Application of Standard V(C) Record Retention

Example 1:

A member bases his research reports on interviews, his own analysis, and industry reports from third parties on his industry and related industries.

Comment:

The member must keep records of all the information that went into the research on which his reports and recommendations are based.

Example 2:

When a member leaves a firm at which he has developed a complex trading model, he takes documentation of the model assumptions and how they were derived over time with him because he will use the model at his new firm.

Comment:

Taking these materials without permission from his previous employer is a violation of his duties to his (previous) employer. While he may use knowledge of the model at the new firm, the member must recreate the supporting documents. The originals are the property of the firm where he worked on developing the model.



MODULE QUIZ 42.8

1. Gail Stefano, CFA, an analyst for a U.S. brokerage firm that serves U.S. investors, researches public utilities in South American emerging markets. Stefano makes

the following statement in a recent report: "Based on the fact that the South American utilities sector has seen rapid growth in new service orders, we expect that most companies in the sector will be able to convert the revenue increases into significant profits. We also believe the trend will continue for the next three to five years." The report goes on to describe the major risks of investing in this market, in particular the political and exchange rate instability associated with South American countries. Stefano's report:

A. has not violated the Code and Standards.

B. violated the Code and Standards by failing to properly distinguish factual information from opinions.

C. violated the Code and Standards by failing to properly identify details related to the operations of South American utilities.

2. Which of the following is *most likely* a violation of Standard III(B) Fair Dealing?

A. A firm makes investment recommendations and also manages a mutual fund. The firm routinely begins trading for the fund's account 10 minutes before announcing recommendation changes to client accounts.

B. After releasing a general recommendation to all clients, an analyst calls the firm's largest institutional clients to discuss the recommendation in more detail.

C. A portfolio manager allocates IPO shares to all client accounts, including her brother's fee-based retirement account.

3. Eugene Nieder, CFA, has just accepted a new job as a quantitative analyst for Paschal Investments, LLP. Nieder developed a complex model while working for his previous employer and plans to recreate the model for Paschal. Nieder did not make copies of the model or any supporting documents since his employer refused to grant him permission to do so. Nieder will recreate the model from memory. Which of the following statements is *most likely* correct?

A. Nieder can recreate the model without violating the Code and Standards as long as he also generates supporting documentation.

B. Nieder can recreate the model without violating the Code and Standards without documentation if the model is modified from its original form.

C. Nieder cannot recreate the model without violating the Code and Standards because it is the property of his former employer.

4. Fred Johnson, CFA, a financial analyst and avid windsurfer, has begun an investment survey of the water sports leisure industry. His brother sells windsurfing gear in Tampa and tells him that Swordfish9 is the "hottest windsurfing rig on the market and will be highly profitable for Swordfish Enterprises." Johnson had never heard of Swordfish9 previously, but after testing the board himself became very excited about the Swordfish9 and issued an investment recommendation of "buy" on Swordfish Enterprises. As a result of issuing the recommendation, Johnson has:

A. not violated the Code and Standards.

B. violated the Code and Standards by failing to establish a reasonable and adequate basis.

C. violated the Code and Standards by failing to consider the suitability of the investment for his clients.

5. Which of the following actions is a *required*, rather than *recommended*, action under the Standard regarding diligence and a reasonable basis for a firm's research recommendations?

A. Have a policy requiring that research reports and recommendations have a basis that can be substantiated as reasonable and adequate.

B. Compensate analysts based on measurable criteria to assess the quality of their research.

C. Review the assumptions used and evaluate the objectivity of externally generated research reports.

MODULE 42.9: STANDARD VI



Video covering
this content is
available online.

VI Conflicts of Interest

VI(A) Disclosure of Conflicts. Members and Candidates must make full and fair disclosure of all matters that could reasonably be expected to impair their independence and objectivity or interfere with respective duties to their clients, prospective clients, and employer. Members and Candidates must ensure that such disclosures are prominent, are delivered in plain language, and communicate the relevant information effectively.

Guidance

Members must fully disclose to clients, prospects, and their employers all actual and potential conflicts of interest in order to protect investors and employers. These disclosures must be clearly stated.

Guidance—Disclosure to Clients

The requirement that all potential areas of conflict be disclosed allows clients and prospects to judge motives and potential biases for themselves. Disclosure of broker-dealer market-making activities would be included here. Board service is another area of potential conflict.

The most common conflict which requires disclosure is actual ownership of stock in companies that the member recommends or that clients hold.

Another common source of conflicts of interest is a member's compensation/bonus structure, which can potentially create incentives to take actions that produce immediate gains for the member with little or no concern for longer-term returns for the client. Such conflicts must be disclosed when the member is acting in an advisory capacity and must be updated in the case of significant change in compensation structure.

Guidance—Disclosure of Conflicts to Employers

Members must give the employer enough information to judge the impact of the conflict. Take reasonable steps to avoid conflicts, and report them promptly if they occur.

Recommended Procedures of Compliance

Any special compensation arrangements, bonus programs, commissions, and incentives should be disclosed.

Application of Standard VI(A) Disclosure of Conflicts

Example 1:

An investment management partnership sells a significant stake to a firm that is publicly traded. The partnership has added the firm's stock to its recommended list and approved its commercial paper for cash management accounts.

Comment:

Members are required to disclose such a change in firm ownership to all clients. Further, any transactions in client accounts involving the securities of the public firm, and any recommendations concerning the public firm's securities, must include a disclosure of the business relation between it and the partnership.

Example 2:

A member provides clients with research about a company's stock, and his wife inherits a significant amount of stock in the company.

Comment:

The member must disclose this potential conflict to his employer and in any subsequent reports or recommendations he authors. His employer may prudently choose to reassign the stock.

Example 3:

A member's investment banking firm receives a significant number of options as partial compensation for bringing a firm public. The member will profit personally from a portion of these options as well.

Comment:

In any research report on the public firm's securities, the member must disclose the fact that these options exist and include their number and the expiration date(s). Because he will profit personally from these, he must also disclose the extent of his participation in these options.

Example 4:

A member accepts an offer from a stock promoter who will provide additional compensation when the member sells Acme stock to his clients. He does not inform his clients or his employer.

Comment:

The member is in violation of the Standard because he must disclose this additional compensation to those clients to whom he recommends the stock and to his employer. Both have a right to determine for themselves the extent to which this additional compensation might affect the member's objectivity.

Example 5:

A member who is a portfolio manager for a small investment management firm serving individuals accepts a job as a trustee of an endowment fund that has over €1.5 billion in assets and does not disclose this to her employer.

Comment:

This is a significant position that may require a substantial portion of the member's time and may involve decisions on security selection and trading. The member is in violation of the Standard by not disclosing this involvement to her employer and by not discussing it with her employer before accepting the position.

Example 6:

A member replaces his firm's external manager, which has had average results, with a friend's firm.

Comment:

Taking such action without disclosing to his firm that the new manager is a personal friend is a violation of the Standards.

Example 7:

A member who is a portfolio manager participates in her employer's defined contribution pension plan through automatic contributions each pay period. The investment choices in the plan are large, diversified mutual funds, including one fund that is managed by her employer.

Comment:

The Standard does not require the member to disclose her personal investments in diversified funds unless this is her firm's policy, nor does it require preclearance for her automatic payroll deductions. The member should follow her firm's policies with regard to preclearing and disclosing her investments in firm-managed funds.

VI(B) Priority of Transactions. Investment transactions for clients and employers must have priority over investment transactions in which a Member or Candidate is the beneficial owner.

Guidance

Client transactions take priority over personal transactions and over transactions made on behalf of the member's firm. Personal transactions include situations where the member is a "beneficial owner." Personal transactions may be undertaken only after clients and the member's employer have had an adequate opportunity to act on a recommendation. Note that family member accounts that are client accounts should be treated just like any client account; they should not be disadvantaged.

Information about pending trades should not be acted on for personal gain. The overriding considerations with respect to personal trades are that they do not disadvantage any clients.

Recommended Procedures for Compliance

All firms should have in place basic procedures that address conflicts created by personal investing. The following areas should be included:

- Limited participation in equity IPOs. Members can avoid these conflicts by not participating in IPOs.
- Restrictions on private placements. Strict limits should be placed on employee acquisition of these securities and proper supervisory procedures should be in place. Participation in these investments raises conflict of interest issues, similar to IPOs.
- Establish blackout/restricted periods. Employees involved in investment decision-making should have blackout periods prior to trading for clients—no

“front running” (i.e., purchase or sale of securities in advance of anticipated client or employer purchases and sales). The size of the firm and the type of security should help dictate how severe the blackout requirement should be.

- Reporting requirements. Supervisors should establish reporting procedures, including duplicate trade confirmations, disclosure of personal holdings/beneficial ownership positions, and preclearance procedures.
- Disclosure of policies. Members must fully disclose to investors their firm’s personal trading policies.

Members should encourage their firms to adopt such procedures if they have not.

Application of Standard VI(B) Priority of Transactions

Example 1:

A member who is a research analyst does not recommend a stock to his employer because he wants to purchase it quickly for his personal account.

Comment:

He has violated the priority of transactions by withholding this information from his employer and seeking to profit personally at his employer’s expense. The member has likely violated his duty to his employer under Standard IV(A) Loyalty as well.

Example 2:

A member who manages a fund gets hot IPO shares for her husband’s account from syndicate firms, even when the fund is unable to get shares.

Comment:

The member has violated the Standard by this action. She must act in the interest of the shareholders of the fund and place allocated shares there first. She must also inform her employer of her participation in these offerings through her beneficial interest in her husband’s account(s).

Example 3:

A member allows an employee to continue his duties without having signed a required report of his personal trading activity over the last three months. The employee, a CFA candidate, has been purchasing securities for his own account just before firm buy recommendations have been released.

Comment:

The employee has violated the Standard. The member has also violated Standard IV(C) Responsibilities of Supervisors by allowing the employee to continue in his regular duties.

Example 4:

A member reveals a sell rating on some securities in a broadcast to all of her firm’s brokers. The changed rating is sent to clients the next day. Shortly after revealing the change to her firm’s brokers and prior to dissemination to clients, she buys puts on the stock for her firm’s account.

Comment:

The member did not give clients adequate opportunity to act on the change in recommendation before buying the puts for her firm's account.

VI(C) Referral Fees. Members and Candidates must disclose to their employer, clients, and prospective clients, as appropriate, any compensation, consideration, or benefit received from, or paid to, others for the recommendation of products or services.

Guidance

Members must inform employers, clients, and prospects of any benefit received for referrals of customers and clients, allowing them to evaluate the full cost of the service as well as any potential partiality. All types of consideration must be disclosed.

Recommended Procedures for Compliance

Members should encourage their firms to adopt clear procedures regarding compensation for referrals. Firms that do not prohibit such fees should have clear procedures for approval, and members should provide their employers with updates at least quarterly regarding the nature and value of referral compensation received.

Application of Standard VI(C) Referral Fees**Example 1:**

Jim Banaji is a banker who receives bonus compensation for each client referred to the bank's brokerage division. Banaji chooses to not disclose this arrangement to his clients.

Comment:

Banaji has violated Standard VI(C) by not disclosing the referral arrangement at the bank to his clients. Members and candidates must disclose all such referral fees. Therefore, the disclosure should include the nature and the value of the benefit and should be made in writing.

Example 2:

An investment consultant conducts an independent and objective analysis of investment managers for a pension fund and selects the best one. Subsequently, the selected advisor makes a payment to the consultant.

Comment:

This is a violation of the Standard. The potential for a payment should have been disclosed to the pension fund. There are very likely regulatory or legal considerations with regard to such payment as well.

**MODULE QUIZ 42.9**

1. Which of the following is *least likely* a violation of Standard VI(B) Priority of Transactions? An analyst:

- A. trades for her own account before her firm announces a change in a recommendation.
 - B. trades for her son's trust account, which is not a firm account, on the day after her firm changes its buy/sell recommendation.
 - C. takes a position for her own outside account in a stock one week after she published a buy recommendation for the stock.
2. As part of an agreement with Baker Brokerage, Hern Investment Company, a money manager for individual clients, provides monthly emerging market overviews in exchange for prospective client referrals and European equity research from Baker. Clients and prospects of Hern are not made aware of the agreement, but clients unanimously rave about the high quality of the research provided by Baker. As a result of the research, many clients with non-discretionary accounts have earned substantial returns on their portfolios. Managers at Hern have also used the research to earn outstanding returns for the firm's discretionary accounts. Which of the following statements is *most likely* correct? Hern:
- A. has not violated the Code and Standards.
 - B. has violated the Code and Standards by using third-party research in discretionary accounts.
 - C. has violated the Code and Standards by failing to disclose the referral agreement with Baker.
3. Neiman Investment Co. receives brokerage business from Pick Asset Management in exchange for referring prospective clients to Pick. Pick advises clients—in writing, at the time the relationship is established—of the nature of its arrangement with Neiman. With regard to this practice, Pick has:
- A. complied with the Code and Standards.
 - B. violated the Code and Standards by failing to preserve the confidentiality of the agreement with Neiman.
 - C. violated the Code and Standards by inappropriately negotiating an agreement that creates a conflict of interest.
4. Daniel Lyons, CFA, is an analyst for a French firm that sells investment research to European companies. Lyons's aunt owns 30,000 shares of French National Bank (FNB). She informs Lyons that as a part of her estate planning she has created a trust in his name into which she has placed 2,000 shares of FNB. The trust is structured so that Lyons will not receive control of the assets for two years, at which time his aunt will also gift her current home to Lyons and move into a retirement community. Lyons is due to update his research coverage of FNB next week. Lyons should *most appropriately*:
- A. advise his superiors that he is no longer able to issue research recommendations on FNB.
 - B. update the report without notification since the shares are held in trust and are beyond his direct control.
 - C. disclose the situation to his employer and, if then asked to prepare a report, also disclose the situation in the report.

MODULE 42.10: STANDARD VII



Video covering
this content is
available online.

VII Responsibilities as a CFA Institute Member or CFA Candidate

VII(A) Conduct as Participants in CFA Institute Programs. Members and Candidates must not engage in any conduct that compromises the reputation or integrity of CFA Institute or the CFA designation or the integrity, validity, or security of CFA Institute programs.



PROFESSOR'S NOTE

The Standard is intended to cover conduct such as cheating on the CFA exam or otherwise violating rules of CFA Institute or the CFA Program. It is not intended to prevent anyone from expressing any opinions or beliefs concerning CFA Institute or the CFA Program.

Members must not engage in any activity that undermines the integrity of the CFA charter. This Standard applies to conduct which includes:

- Cheating on the CFA exam or any exam administered by CFA Institute (e.g., CIPM).
- Revealing anything about either broad or specific topics tested, content of exam questions, or formulas required or not required on the exam.
- Not following rules and policies of any CFA Institute program.
- Giving confidential information on the CFA Program to candidates or the public.
- Improperly using the designation to further personal and professional goals.
- Misrepresenting information on the Professional Conduct Statement (PCS) or the CFA Institute Professional Development Program.

Members and candidates are not precluded from expressing their opinions regarding the exam program or CFA Institute but must not reveal confidential information about the CFA Program.

Candidates who violate any of the CFA exam policies (calculator, personal belongings, Candidate Pledge) have violated Standard VII(A).

Members who volunteer in the CFA Program may not solicit or reveal information about questions considered for or included on a CFA exam, about the grading process, or about scoring of questions.

Application of Standard VII(A) Conduct as Participants in CFA Institute Programs

Example 1:

A member who volunteers at a local CFA society schedules her own clients for their regularly scheduled company presentations at the society, while excluding non-client firms.

Comment:

The member, by using her volunteer position at a local society to benefit herself and her clients, compromises the reputation and integrity of CFA Institute and, thus, violates Standard VII(A).

Example 2:

A member who is an exam grader discusses with friends the guideline answer for and relative candidate performance on a specific question he graded on the CFA exam.

Comment:

He has violated his Grader's Agreement and also the Standard by compromising the integrity of the CFA exam.

Example 3:

A candidate does not stop writing when asked to by the proctor at the CFA exam.

Comment:

By taking additional time compared to other candidates, this candidate has violated the Standard, compromising the integrity of the exam process.

Example 4:

A member who is a volunteer on a CFA Institute committee tells her clients that what she learns through her committee work will allow her to better serve their interests.

Comment:

She has violated the Standard by using her CFA committee position to benefit herself personally and to any extent her "inside" knowledge has benefited her clients.

Example 5:

A candidate tells another candidate, "I'm sure glad that Bayes' formula was not on the Level I test this year."

Comment:

This is a violation of Standard VII(A). Candidates are not permitted to reveal any formulas required or not required on a CFA exam.

Example 6:

A candidate tells his beloved CFA instructor, "I really appreciate the emphasis that you put on Financial Reporting and Analysis because that was a huge part of the test this year."

Comment:

This is a violation of Standard VII(A). Candidates are not permitted to disclose the relative weighting of topics on the exam.

Example 7:

A candidate tells his mother, "There was an item set on the CFA exam on the Residual Income Model that just kicked my butt."

Comment:

This is a violation of Standard VII(A). Candidates are not permitted to disclose specific topics tested on the exam.

VII(B) Reference to CFA Institute, the CFA Designation, and the CFA Program.

When referring to CFA Institute, CFA Institute membership, the CFA designation, or candidacy in the CFA Program, Members and Candidates must not misrepresent or exaggerate the meaning or implications of membership in CFA Institute, holding the CFA designation, or candidacy in the CFA Program.

Guidance

Members must not make promotional promises or guarantees tied to the CFA designation. Do not:

- Over-promise individual competence.
- Over-promise investment results in the future (i.e., higher performance, less risk, etc.).

Guidance—CFA Institute Membership

Members must satisfy these requirements to maintain membership:

- Sign PCS annually.
- Pay CFA Institute membership dues annually.

If they fail to do this, they are no longer active members.

Guidance—Using the CFA Designation

Do not misrepresent or exaggerate the meaning of the designation. Use of the CFA designation by a charterholder is subject to terms of the annual Professional Conduct Statement Agreement.

Guidance—Referencing Candidacy in the CFA Program

There is no partial designation. It is acceptable to state that a candidate successfully completed the program in three years, if in fact he did, but claiming superior ability because of this is not permitted.

Recommended Procedures for Compliance

Make sure that members' and candidates' firms are aware of the proper references to a member's CFA designation or candidacy, as this is a common error.



PROFESSOR'S NOTE

While using "CFA" as a noun is no longer a violation of the Code of Standards, CFA Institute still considers this to be a misuse of the CFA designation trademark, and a violation of a CFA charterholder's trademark license agreement.

Application of Standard VII(B) Reference to CFA Institute, the CFA Designation, and the CFA Program

Example 1:

Supra Investments has advertised that all of the firm's directors are CFA charterholders that passed their exams on first attempts. This fact is prominently linked to the firm's superior performance.

Comment:

Supra can make factual statements (about the qualifications of the directors as well as passing the examinations on the first try) but cannot link these facts to the firm's performance; to do so would violate Standard VII(B).

Example 2:

A member chose to move out of the investment profession and did not renew his membership with the CFA Institute. Several years later, he decided to pursue an opportunity in private equity and submitted his resume with CFA qualification after his name.

Comment:

The member has violated Standard VII(B) because his right to use the CFA designation was suspended when he stopped paying dues. Prior to using the designation again, the member must complete CFA Institute reinstatement procedures.

Example 3:

A member still uses the initials CFA after his name even though his membership has been suspended for not paying dues and for not submitting a personal conduct statement as required.

Comment:

This is a violation of the Standard.

Example 4:

A member puts the CFA logo on his letterhead, his business cards, and the company letterhead.

Comment:

By putting the logo on the company letterhead (rather than the letterhead or business card of an individual who is a CFA charterholder), the member has violated the Standard.

Example 5:

A member maintains an online account on a popular internet forum using the name "Old_CFA_Charterholder." The member is not otherwise identified in the forum.

Comment:

This use of the designation violates the Standard because the name hides the member's identity.



MODULE QUIZ 42.10

1. Paula Osgood, CFA, is promoting her new money management firm by issuing an advertisement. Which of these items is *least likely* a violation of the professional designation Standard? The advertisement states that:
 - A. she passed three exams covering ethics, financial statement analysis, asset valuation, and portfolio management, and that she is a member of the local society. Osgood signs the advertisement followed by the letters CFA in oversized and bold strike letters.
 - B. she passed three 6-hour exams on her first attempts over the minimum period of one and a half years. Knowledge tested included ethics, financial statement analysis, asset valuation, and portfolio management. In addition, she is a member of the local society.
 - C. because of her extensive CFA training, she will be able to achieve better investment results than non-CFA managers since she is one of very few

professionals to have been awarded this designation.

2. Frist Investments, Inc. has just hired Michael Pulin to manage institutional portfolios, most of which are pension related. Pulin has just taken the Level III CFA Program exam and is awaiting his results. Pulin has more than 15 years of investment management experience with individual clients but has never managed an institutional portfolio. Pulin joined the CFA Institute as an affiliate member two years ago and is in good standing with the organization. Which of the following statements would be *most appropriate* for Frist to use in advertising Pulin as a new member of the firm? Pulin:
 - A. has many years of investment experience which, along with his participation in the CFA Program, will allow him to deliver superior investment performance relative to other managers.
 - B. is a CFA Level III and passed the first two exams on the first attempt. He is an affiliate member of the CFA Institute. We expect him to become a regular member if he passes the Level III examination.
 - C. is a Level III CFA candidate and has many years of excellent performance in the investment management industry. Pulin is an affiliate member of the CFA Institute and will be eligible to become a CFA charterholder and regular member if he passes the Level III CFA Program exam.
3. Samantha Donovan, CFA, is an exam proctor for the Level II CFA Program exam. The day before the exam is to be administered, Donovan faxes a copy of one of the questions to two friends, James Smythe and Lynn Yeats, who are Level II candidates in the CFA Program. Donovan, Smythe, and Yeats had planned the distribution of an exam question months in advance. Smythe used the fax to prepare for the exam. Yeats, however, had second thoughts and threw the fax away without looking at its contents. Which of the following statements is *most likely* correct?
 - A. Smythe violated the Code and Standards, but Yeats did not.
 - B. Donovan violated the Code and Standards, but Smythe did not.
 - C. Donovan and Yeats both violated the Code and Standards.
4. After sitting for the Level I CFA exam, Cynthia White visits CFA Haven, an online forum, to express her frustration. White writes, "CFA Institute is not doing a competent job of evaluating candidates, because none of the questions in the June exam touched on Alternative Investments." Regarding the CFA Institute Standards of Professional Conduct, White *most likely*:
 - A. did not violate any Standard, as she was exercising her right to freedom of speech.
 - B. violated the Standards by discussing exam content.
 - C. violated the Standards by impugning the reputation of CFA Institute.
5. After passing all three levels of the CFA Program examinations on her first attempts and being awarded her CFA charter, Paula Osgood is promoting her new money management firm by issuing an advertisement. Which of these statements would *most likely* violate the Standard related to use of the CFA designation?
 - A. "To earn the right to use the CFA designation, Paula passed three exams covering ethics, financial statement analysis, asset valuation, and portfolio management."
 - B. "Paula passed three 6-hour exams on her first attempts and is a member of her local investment analyst society."
 - C. "Because of her extensive training, Paula will be able to achieve better investment results than managers who have not been awarded the CFA designation."

LOS 41.a, LOS 41.b

Members of CFA Institute (including CFA charterholders) and candidates for the CFA designation ("Members and Candidates") must:⁴

- Act with integrity, competence, diligence, and respect, and in an ethical manner with the public, clients, prospective clients, employers, employees, colleagues in the investment profession, and other participants in the global capital markets.
- Place the integrity of the investment profession and the interests of clients above their own personal interests.
- Use reasonable care and exercise independent professional judgment when conducting investment analysis, making investment recommendations, taking investment actions, and engaging in other professional activities.
- Practice and encourage others to practice in a professional and ethical manner that will reflect credit on themselves and the profession.
- Promote the integrity and viability of the global capital markets for the ultimate benefit of society.
- Maintain and improve their professional competence and strive to maintain and improve the competence of other investment professionals.

The Standards of Professional Conduct are organized into seven standards:

- I. Professionalism
- II. Integrity of Capital Markets
- III. Duties to Clients
- IV. Duties to Employers
- V. Investment Analysis, Recommendations, and Action
- VI. Conflicts of Interest
- VII. Responsibilities as a CFA Institute Member or CFA Candidate

ANSWER KEY FOR MODULE QUIZZES

Module Quiz 41.1, 42.1

1. **C** According to Standard I(A), informing her supervisor or firm's compliance department is appropriate. Dissociating herself would be premature. She should report her suspicions to a supervisory person and attempt to remedy the situation. (Module 42.1, LOS 42: I(A))
2. **B** According to Standard I(A), since she has taken steps to stop the illegal activities and the board has ignored her, Jones must dissociate from the board and seek legal advice as to what other actions would be appropriate in this instance. She may need to inform legal or regulatory authorities of the illegal activities. (Module 42.1, LOS 42: I(A))
3. **C** According to Standard I(A), in some instances, reporting a legal violation to governmental or regulatory officials may be appropriate, but this isn't always necessary, and it isn't required under Standard I(A). (Module 42.1, LOS 42: I(A))

4. **A** Standard I(B), Independence and Objectivity, requires that members and candidates reject offers of gifts or compensation that could compromise their independence or objectivity. Schleifer has appropriately rejected the offer of the hotel accommodations and the use of ChemCo's jet. He may accept the desk clock since this gift is of nominal value and is unlikely to compromise his independence and objectivity. Schleifer cannot accept the tickets to the dinner, however. Since it is a formal high-society dinner, the tickets are most likely expensive or difficult to come by. Even though he has disclosed the gift to his employer and he plans to use the dinner as a marketing opportunity for his firm, the gift itself may influence Schleifer's future research in favor of ChemCo. Allowing such potential influence is a violation of Standard I(B). (Module 42.1, LOS 42: I(B))
5. **C** Standard I(B) recommends, but does not require, that an analyst have his firm pay for ordinary travel expenses to visit companies that are the subject of research. The other choices are required by the Standards. (Module 42.1, LOS 42: I(B))

Module Quiz 42.2

1. **A** Hutchins's personal bankruptcy may reflect poorly on her professional reputation if it resulted from fraudulent or deceitful business activities. There is no indication of this, however, and the bankruptcy is thus not a violation. Smith has not violated the Code and Standards by refusing to invest with Hutchins in what turned out to be bad investment opportunities. By reporting Smith to CFA Institute for a violation, Hutchins has misused the Professional Conduct Program to settle a dispute unrelated to professional ethics and has thus violated Standard I(D), Misconduct. (LOS 42: I(D))
2. **B** According to Standard I(C), Misrepresentation, factual data from a recognized statistical reporting service need not be cited. (LOS 42: I(C))
3. **B** In the other choices, Olson violates Standard I(C) by misrepresenting the services that she or her firm are capable of performing, her qualifications, her academic or professional credentials, or the firm's credentials. The firm is small and most likely cannot perform all investment services the client may require. The firm cannot guarantee future outperformance of the market indexes. The firm doesn't have a long history (only six months). (LOS 42: I(C))
4. **C** There can be no assurance that a premium of 2% to 4% will consistently be obtained. Bixby is in violation of Standard I(C), Misrepresentation, since she has made an implicit guarantee of the fund's expected performance. (LOS 42: I(C))
5. **C** Since the statements are vague, we have no direct evidence that a violation of securities law has occurred. However, under Standard I(D), Misconduct, members and candidates are prohibited from engaging in activities involving deceit. Karloff's action is a clear attempt to mislead the investing public regarding the value of Summit IPOs. (LOS 42: I(D))

Module Quiz 42.3

1. **C** According to Standard II(A), members and candidates are under no circumstances allowed to use material nonpublic information to trade securities. Carlson must abide by the Code and Standards, which is the most strict regulation in the scenario. (LOS 42: II(A))
2. **B** The intent of Green Brothers' actions is to manipulate market liquidity in order to attract investment to its own funds. The increased trading activity was not based on market fundamentals or an actual trading strategy to benefit investors. It was merely an attempt to mislead market participants in order to increase assets under Green Brothers' management. The action violates Standard II(B), Market Manipulation. (LOS 42: II(B))
3. **A** Quigley's trades are most likely an attempt to take advantage of an arbitrage opportunity that exists between Craeger's common stock and its put options. She is not manipulating the prices of securities in an attempt to mislead market participants, which would violate Standard II(B), Market Manipulation. She is pursuing a legitimate investment strategy. Participants in her hedge fund are aware of the fund's investment strategy, and thus Quigley did not violate the Code and Standards by not disclosing this specific set of trades in advance of trading. (LOS 42: II(B))
4. **A** There is no indication that Servais has inside information pertaining to the situation at the five firms in question—only the two firms that have already gone public with the information. It is common knowledge that the other five firms follow the same boron handling procedures. She is, therefore, in compliance with Standard II(A) concerning the use of material nonpublic information in the issuance of the investment recommendation. (LOS 42: II(A))
5. **B** Even though the laws of Zanuatu would not preclude trading on the information, as a CFA Charterholder, the friend is bound by the CFA Institute Code and Standards. Standard II(A) prohibits the use of material nonpublic information, and the friend may not trade the stocks about which she has such information under any circumstances. (LOS 42: II(A))
6. **B** The release of such information to a limited circle via an internet chat room does not cause the information to be public. The information is also clearly material. Therefore, Green is not allowed to trade on the information under Standard II(A). (LOS 42: II(A))
7. **B** NV management is asking Hunter to violate Standard II(B), Market Manipulation, which prohibits taking actions that are designed to distort prices or artificially increase trading volume. The intent of Hunter's actions is to mislead market participants and allow corporate insiders to take advantage of the artificially high prices. (LOS 42: II(B))

Module Quiz 42.4

1. **B** Standard III(A), Loyalty, Prudence, and Care. Herbst is acting as a fiduciary for the pension plan beneficiaries. Choosing brokers based on quality of services provided is reasonable. She may pay higher-than-average brokerage fees so long as doing so benefits the pension beneficiaries, not other clients. Trading with selected brokers solely to gain referrals is not likely to be in the pension

beneficiaries' best interest since it does not take into account other important factors for selecting brokerage firms. (LOS 42: III(A))

Module Quiz 42.5

1. **B** Standard III(C), Suitability, requires that before taking investment action, members and candidates must make a reasonable inquiry into a client's or prospect's investment objectives and constraints as well as their prior investment experience. Byrne cannot assume that because the brothers have similar lifestyles and are close in age that they should have similarly managed portfolios. Byrne should have interviewed Cliff directly before investing his portfolio. (LOS 42: III(C))
2. **B** According to Standard III(C), Ellis must consider the suitability of each new investment (as well as the current holdings) in light of the portfolio mandate. In this given case, the client is the fund. Ellis must only make investments that are in accordance with the fund's investment policy statement. Therefore, Ellis should not purchase the unsuitable bonds as requested by her clients. (LOS 42: III(C))
3. **C** Standard III(B), Fair Dealing, requires that members not selectively disadvantage clients, specifically in the case of IPOs. Disclosure of an inequitable allocation method does not relieve the member of his obligation to fair dealing. (LOS 42: III(B))

Module Quiz 42.6

1. **B** By failing to include terminated portfolios in the performance presentation, the performance will have an inherent upward bias, making results appear better than they truly are. By excluding the terminated portfolios, DNR misleads its potential investors and thus violates Standard III(D), Performance Presentation, which prohibits any "practice that would lead to misrepresentation of a member or candidate's performance record." (LOS 42: III(D))
2. **A** Anderson must maintain the confidentiality of client information according to Standard III(E). Confidentiality may be broken in instances involving illegal activities on the part of the client, but the client's information may only be relayed to proper authorities. Anderson did not have the right to inform the investment bank of her client's investigation. (LOS 42: III(E))
3. **B** The recommended procedure in Standard III(D), Performance Presentation, is to present the performance of a composite as a weighted average of the performance of similar portfolios rather than using a single representative account. (LOS 42: III(D))

Module Quiz 42.7

1. **C** According to Standard IV(A), Loyalty, members and candidates are expected to act for the benefit of the employer and not deprive the employer of their skills. Fletcher is performing work similar to the services that her employer provides for a fee. Although the position is a volunteer position, Fletcher will receive compensation in the form of a free parking space. In light of the

circumstances, Fletcher must disclose the details of the position and get written permission from her employer before accepting the volunteer position. (LOS 42: IV(A))

2. **C** Members and candidates with oversight responsibilities for large numbers of employees may not be able to personally evaluate the conduct of these employees on a continuing basis, and thus they may delegate supervisory duties to subordinates who directly oversee the other employees.

A member or candidate faced with no compliance procedures or with procedures she believes are inadequate must decline supervisory responsibility in writing until adequate procedures are adopted by the firm.

According to Standard IV(C), Responsibilities of Supervisors, reporting the violation and warning the employee to cease activities that violate the law or the Code and Standards are not enough. The supervisor must take steps (such as limiting employee activity or increasing the level of employee monitoring) to prevent further violations while she conducts an investigation. (LOS 42: IV(C))

3. **C** According to Standard IV(C), because he is aware that the firm's compliance procedures are not being monitored and followed and because he has repeatedly tried to get company management to correct the situation, Blair should decline supervisory responsibility until adequate procedures to detect and prevent violations of laws, regulations, and the Code and Standards are adopted and followed. If he does not do so, he will be in violation of the Code and Standards. (LOS 42: IV(C))
4. **B** Jamal failed to properly supervise employees and provide adequate procedures and policies to prevent employee violations. Smith should not have traded her own account ahead of client accounts. Temple should not have disclosed the recommendation change selectively but should have informed his clients fairly and objectively. No inside information was used in the question. (LOS 42: IV(C))
5. **A** Albright may accept work for which she receives outside compensation and which may compete with her employer only if she obtains her employer's consent. Under Standard IV(A), Loyalty, such consent must be obtained from her employer prior to beginning the work. (LOS 42: IV(A))

Module Quiz 42.8

1. **A** Historical growth can be cited as a fact since it actually happened. Stefano states that her firm expects further growth and profitability, which is an opinion. She does not claim that these are facts. In addition, Stefano identifies relevant factors and highlights in particular the most significant risks of investing in South American utilities. She has fully complied with Standard V(B), Communication with Clients and Prospective Clients. Under the Standard, it is not necessary to include every detail about a potential investment in a report. Members and candidates are expected to use their judgment and identify the most important factors to include. (LOS 42: V(B))

2. **A** Choice B is not necessarily a violation. Firms can offer different levels of service to clients as long as this is disclosed to all clients. The largest institutional clients would likely be paying higher fees for a greater level of service. Also note that the analyst's brother's account in choice C should be treated the same as any other client account. (LOS 42: V(B))
3. **A** Nieder must not take models or documents from his previous employer without explicit permission to do so, or he would violate Standard IV(A), Loyalty. He is allowed, however, to reproduce the model from memory but must recreate the supporting documentation to maintain compliance with Standard V(C), Record Retention. (LOS 42: V(A))
4. **B** Johnson has apparently let his recreational passion cloud his judgment. This is not to say that Swordfish Enterprises is not or will not be an excellent investment. However, if he had never heard of the firm previously, issuing an investment recommendation without conducting a thorough financial investigation indicates a failure to exercise diligence and also indicates that he lacks a reasonable and adequate basis for his recommendation. He is in violation of Standard V(A). (LOS 42: V(A))
5. **C** It is required under Standard V(A), Diligence and Reasonable Basis, that third-party research assumptions be reviewed and both the independence and objectivity of the research and recommendations be evaluated. The other choices are recommended policies and procedures under the Standard. (LOS 42: V(A))

Module Quiz 42.9

1. **C** Members and candidates must give clients adequate opportunity to act on new or changed recommendations before taking investment action in their own non-firm accounts or other non-client accounts in which they have a beneficial interest. One week is likely an acceptable waiting period. (LOS 42: VI(B))
2. **C** According to Standard VI(C), Referral Fees, Hern must disclose the referral arrangement between itself and Baker so that potential clients can judge the true cost of Hern's services and assess whether there is any partiality inherent in the recommendation of services. (LOS 42: VI(C))
3. **A** There is no violation of the CFA Institute Standards regarding this matter. The referral arrangement is fully disclosed to clients before they agree to do business with Pick. Therefore, clients can fully assess the effect of the agreement on the referral and how the agreement may affect their accounts before hiring Pick as their asset manager. (LOS 42: VI(C))
4. **C** Even though the shares are held in trust, this could still be construed as a conflict of interest. Lyons is obligated under Standard VI(A), Disclosure of Conflicts, to inform his employer of the potential conflict. If he is then authorized to issue investment recommendations on the security in question, the existence of a potential conflict must be disclosed in the report. (LOS 42: VI(A))

Module Quiz 42.10

1. **B** According to Standard VII(B), any explanation of the designation in print form should be a concise description of the requirements or of CFA Institute. The other statements contain violations of Standard VII(B), in particular the presentation of the letters CFA. Also, she may not imply superior performance as a result of being a CFA charterholder. (LOS 42: VII(B))
2. **C** Standard VII(B) governs acceptable methods of referencing the CFA Institute, CFA designation, and CFA Program. Candidates may reference their candidacy if they are enrolled for or waiting for the results of, a CFA Program exam. Pulin may also reference his membership status with the CFA Institute as well as his remaining eligibility requirements to become a CFA charterholder. (LOS 42: VII(B))
3. **C** In this situation, Donovan, Smythe, and Yeats all violated Standard VII(A), Conduct as Participants in CFA Institute Programs. The Standard prohibits conduct that compromises the integrity, validity, or security of the CFA Program exams. Donovan clearly breached the exam security. Smythe and Yeats both compromised the integrity of the exams by planning to use the actual exam question to gain an advantage over other candidates. Even though Yeats did not ultimately use the information to study for the exam, she participated in a scheme to cheat on the CFA Program exam. (LOS 42: VII(A))
4. **B** Standard VII(A) Conduct as Participants in CFA Institute Programs prohibits candidates from revealing which portions of the Candidate Body of Knowledge were or were not covered on an exam. Members and candidates are free to disagree with the policies, procedures, or positions taken by the CFA Institute and express their opinion on such policies, procedures, and positions. (LOS 2: VII(A))
5. **C** Standard VII(B) Reference to CFA Institute, the CFA Designation, and the CFA Program prohibits members and candidates from implying superior performance as a result of being a CFA charterholder. Concise factual descriptions of the requirements to obtain the CFA charter are acceptable. Osgood's statement that she passed the exams on her first attempts is acceptable because it states a fact. (LOS 42: VII(B))

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READING 43

APPLICATION OF THE CODE AND STANDARDS: LEVEL II

EXAM FOCUS

The cases discussed here introduce you to the obligations CFA Institute members and CFA® charterholders and candidates have under the Code and Standards. These cases will give you a sense of the types of scenarios you are likely to encounter on the Level II exam. The particulars of any case are not important in terms of test questions. However, understanding how to analyze a case and having the ability to recommend procedures to bring an illustrative firm into compliance are crucial to your success on the ethics portion of the exam. There are three additional problem sets (for this reading) covered by the curriculum which provide excellent practice in identifying violations of Code and Standards. Candidates should use those as well in preparing for the Level II exam.

MODULE 43.1: ETHICS CASE STUDIES



Video covering this content is available online.

LOS 43.a: Evaluate practices, policies, and conduct relative to the CFA Institute Code of Ethics and Standards of Professional Conduct.

LOS 43.b: Explain how the practices, policies, and conduct do or do not violate the CFA Institute Code of Ethics and Standards of Professional Conduct.

1. SYYARK CASE OUTLINE

The main facts of the Syyark case are as follows:

- Syyark, CFA, a private client adviser for Gueoe Bank, manages a globally diversified portfolio for client accounts. Syyark also advises clients on their outside holdings, thereby developing strong relationships with them.
- Syyark starts research into cryptocurrencies and realizes that competitive pressures make mining established digital currencies very difficult. Syyark settles on Meerine, a newer cryptocurrency. To limit his risk of being wrong, he recommends Meerine to a few of his smallest clients with an initial recommended allocation of 1% of portfolio.
- After attending several conferences, Syyark starts mining Meerine using his home computer without informing his employer.

- Syyark realizes that the trading volume is low and volatility high for Meerine but is confident about its prospects. Meerine price appreciates since his 1% recommendation. Syyark then recommended a 3% portfolio allocation to Meerine to all clients.
- In subsequent client review meetings, Syyark shares the performance of Meerine, its low correlation with stocks and bonds, and discloses his mining activity. Syyark offers to sell Meerine out of his own account to the firm's larger clients.

CASE RESULTS

Standard III(B) Duties to Clients: Fair Dealing

All clients should be treated fairly when taking investment actions and offering advice. Offering different levels of service is not a violation as long as it does not disadvantage a client group and is disclosed.

Violations of Standard III(B):

- It is not acceptable for Syyark to fill orders of larger clients from his personal account.

Actions required to prevent these violations:

- Collect orders from all clients and fill the orders (if suitable) pro rata or not offer to sell to anybody from his personal account.

Standard III(C) Duties to Clients: Suitability

Investment actions on behalf of the client and investment advice provided to a client must be consistent with client's goals and constraints.

Violations of Standard III(C):

- Even though Syyark has evaluated the risk-reduction benefit of Meerine, blanket 3% allocation may not be suitable for every client.
- The initial 1% allocation recommendation to the smallest client was driven by using those clients as "guinea pigs" (if things don't work out, Syyark's and the bank's reputations would be less tarnished) and not based on suitability for those clients.

Actions required to prevent these violations:

- Properly assess the client's circumstances (including goals and constraints) to determine for which client an investment in Meerine is appropriate and, if so, what an appropriate level of investment should be for that client.

Standard IV(B) Duties to Employer: Additional Compensation Arrangements

Cryptocurrencies compete with banks for transaction completion services. Syyark's mining of Meerine (even on his own computer) might conflict with Gueoe Bank's interest.

Violations of Standard IV(B):

- Failing to inform the employer before engaging in mining activities.

Actions required to prevent these violations:

- Syyark should disclose to a supervisor or compliance officer of his intent to mine Meerine, what his potential earnings would be from this activity, and obtain a written permission before mining.

Standard V(A) Investment Analysis, Recommendations, and Actions: Diligence and Reasonable Basis

Even though Syyark has researched Meerine, this initial recommendation to the smallest clients is not grounded in reasonable basis.

Violations of Standard V(A):

- Syyark's evaluation of cryptocurrencies and Meerine in particular was not thorough.

Actions required to prevent these violations:

- Syyark should document his research into Meerine, the drivers of its value, and clients for which it would be suitable.

Standard VI(A) Conflicts of Interest: Disclosure of Conflicts

Syyark must disclose all conflicts of interest that could reasonably be expected to impair his independence and objectivity.

Violations of Standard VI(A):

- Syyark recommending an investment with limited liquidity which he holds in his personal account would reasonably be construed as a conflict of interest. Not disclosing this conflict would be a violation of Standard VI(A).
- Syyark only reveals his mining activities in client meetings *after* his 3% recommendation is made to all clients.

Actions required to prevent these violations:

- Syyark should disclose the conflict created by his recommendation of Meerine to his clients and his employer which he is mining and currently holds in his personal portfolio.

2. AGARWAY CASE OUTLINE

The main facts of the Agarway case are as follows:

- Agarway, CFA, recently joined CrowdWisdom as VP of due diligence. CrowdWisdom is a young, online crowdfunding company that matches venture capital investors with startups seeking capital. Fee paying applicants that satisfy CrowdWisdom's due diligence would be listed on their platform and made available to all the investors that are members of the platform.
- The founders of CrowdWisdom want to grow rapidly and want to recruit the customers of startups as potential member investors on their platform. Additionally, they created an investment club comprising those members that

were very active investors on the platform. Members of the investment club received a market intelligence report in addition to generally available applicant information.

- Agarway's due diligence process includes several screens that he has successfully tested at his previous job, where he personally invested in several startups. These screens include size of the startup's potential market, accounting policies, interviews with company executives, etc.
- One of the most promising companies that passed Agarway's screen is Deko, an IT startup with impressive founders, attractive prospects, and a unique product. Deko's target customer base is pre-teens and teenagers. The company's strategy calls for soliciting investment from customers via emails. Emails specify that the investors have to be adults over the age of 18.
- Over time, Agarway's stack of applications to be reviewed grows over 300 and the founders are pressuring to have 10% acceptance rate. Agarway explains that there are time constraints in reviewing applications. Founders also recommend that two specific applicants that they met at a conference be accepted.

CASE RESULTS

Standard I(A) Professionalism: Knowledge of the Law

- Members and candidates should understand and comply with all applicable laws and regulations.

Violations of Standard I(A):

- It may not be legal in many jurisdictions to solicit investments from teenagers even if the solicitations specify that it is for adults only.
- Additionally, it may be illegal in many jurisdictions to collect information about minors without the permission of their parents. Sharing of information is further governed by various privacy laws that need to be carefully evaluated.

Actions required to prevent these violations:

- Agarway needs to ensure that Deko is in compliance with all applicable laws and regulations.

Standard VI(A) Conflicts of Interest: Disclosure

- Members and candidates are required to disclose all conflicts of interest that could reasonably be expected to impair their independence and objectivity.

Violations of Standard VI(A):

- Preferential access of market intelligence to members of the investment club may disadvantage other investors.
- Agarway's personal investments may be competing with potential startup applicants creating a conflict of interest.

Actions required to prevent these violations:

- Agarway's personal investments that compete with prospects as well as the preferential access to market intelligence to members of the investment club need to be disclosed to all investors.

Topic Quiz: Ethical and Professional Standards

You have now finished the Ethical and Professional Standards topic section. Please log into your Schweser online dashboard and take the Topic Quiz on this section. The Topic Quiz provides immediate feedback on how effective your study has been for this material. Questions are more exam-like than typical Module Quiz or QBank questions; a score of less than 70% indicates that your study likely needs improvement. These tests are best taken timed; allow three minutes per question.

FORMULAS

Portfolio Management

ETF premium (discount) % = (ETF price – NAV per share) / NAV per share

APT equation:

$$E(R_P) = R_F + \beta_{P,1}(\lambda_1) + \beta_{P,2}(\lambda_2) + \dots + \beta_{P,k}(\lambda_k)$$

expected return = risk free rate + Σ (factor sensitivity) \times (factor risk premium)

active return = factor return + security selection return

multifactor model return attribution:

$$\text{factor return} = \Sigma(\beta_{pi} - \beta_{bi}) \times (\lambda_i)$$

active risk squared = active factor risk + active specific risk

active factor risk = active risk squared – active specific risk

$$\text{active specific risk} = \sum_{i=1}^n (W_{pi} - W_{bi})^2 \sigma_{ei}^2$$

portfolio variance for $W_A\%$ in fund A and $W_B\%$ in fund B:

$$\sigma_{\text{Portfolio}}^2 = W_A^2 \sigma_A^2 + W_B^2 \sigma_B^2 + 2W_A W_B \text{Cov}_{AB}$$

annualized standard deviation = $\sqrt{250} \times$ (daily standard deviation)

percentage change in value due to a change in yield to maturity (ΔY):

$$\% \text{ change in price} = -\text{duration} (\Delta Y) + \frac{1}{2} \text{convexity} (\Delta Y)^2$$

Note: For Macaulay duration rather than modified duration, ΔY is replaced by $\Delta Y / (1 + Y)$.

option value versus future volatility:

$$\text{change in call price} = \text{delta} (\Delta S) + \frac{1}{2} \text{gamma} (\Delta S)^2 + \text{vega} (\Delta V)$$

where ΔV is the change in future volatility

inter-temporal rate of substitution:

inter-temporal rate of substitution =

$$\begin{aligned} m_t &= \frac{\text{marginal utility of consuming 1 unit in the future}}{\text{marginal utility of current consumption of 1 unit}} \\ &= \frac{u_t}{u_0} \end{aligned}$$

$$\text{real risk-free rate of return} = R = \frac{1 - P_0}{P_0} = \left[\frac{1}{E(m_t)} \right] - 1$$

price of a default-free, inflation-indexed, zero-coupon bond:

$$P_0 = \frac{E(P_1)}{(1 + R)} + \text{cov}(P_1, m_1)$$

nominal short term interest rate (r) = real risk-free rate (R) + expected inflation (π)

$$r(\text{long-term}) = R + \pi + \theta$$

where θ = risk premium for uncertainty about inflation

Taylor rule:

$$r = R_n + \pi + 0.5(\pi - \pi^*) + 0.5(y - y^*)$$

break-even inflation rate (BEI):

BEI = yield on non-inflation indexed bond – yield on inflation indexed bond

BEI for longer maturity bonds = expected inflation (π) + risk premium for uncertainty about actual inflation (θ)

required rate of return for credit risky bonds = $R + \pi + \theta + \gamma$

where:

γ = additional risk premium for credit risk = credit spread

discount rate for equity = $R + \pi + \theta + \gamma + \kappa$

where:

κ = additional risk premium relative to risky debt for an investment in equities

λ = equity risk premium = $\gamma + \kappa$

discount rate for commercial real estate = $R + \pi + \theta + \gamma + \kappa + \varphi$

where:

κ = risk premium for uncertainty about terminal value of property (similar to equity risk premium)

φ = risk premium for illiquidity

active return = portfolio return – benchmark return $R_A = R_P - R_B$

$$\text{portfolio return} = R_P = \sum_{i=1}^n w_{P,i} R_i$$

$$\text{benchmark return} = R_B = \sum_{i=1}^n w_{B,i} R_i$$

$$\text{information ratio} = \frac{R_P - R_B}{\sigma_{(R_P - R_B)}} = \frac{R_A}{\sigma_A} = \frac{\text{active return}}{\text{active risk}}$$

portfolio Sharpe ratio:

$$SR = \frac{R_P - R_F}{\sigma_P}$$

$$\text{information ratio} = IR = TC \times IC \times \sqrt{BR}$$

$$\text{expected active return} = E(R_A) = IR \times \sigma_A$$

“full” fundamental law of active management:

$$E(R_A) = (TC)(IC)\sqrt{BR}\sigma_A$$

Sharpe-ratio-maximizing level of aggressiveness:

$$\sigma_A^* = \frac{IR}{SR_B} \sigma_B$$

portfolio total risk versus benchmark risk and active risk:

$$STD(R_P)^2 = STD(R_B)^2 + STD(R_A)^2$$

INDEX

A

- active investing, 10
- active management, 93
- active portfolio risk, 101
- active return, 27, 94
- active risk, 28, 100
- active share, 49
- additional compensation arrangements, 147, 183
- aggressiveness, 100
- alpha, 94
- arbitrage, 18
- arbitrage gap, 2
- arbitrage pricing theory (APT), 17
- asset allocation return, 95
- asset class exposure management, 10
- asset manager operations, 4
- authorized participants (APs), 2

B

- backtesting, 58
- banks, 49
- benchmark portfolio (BM), 60
- benchmark tracking risk, 97
- best price and execution, 135
- beta, 46
- bid-ask spreads, 5
- bootstrapping, 71
- breadth, 100
- break-even inflation rate (BEI), 83
- business cycle, 82

C

- capital allocation, 52

- Carhart model, 31
- CFA as a noun, 169
- CFA exam, 166
- client brokerage, 134
- closet index fund, 97
- Code of Ethics, 111
- communication with clients, 155
- conditional VaR (CVaR), 44, 64
- conduct as participants in CFA Institute programs, 166
- conflicts, 185
- conflicts of interest, 160, 184
- consumption-hedging, 85
- convexity, 46
- counterparty risk, 8
- creation, 2
- creation basket, 2
- credit quality, 85
- cross-validation, 67

D

- data-mining trap, 60
- data snooping, 67
- defined benefit pension funds, 50
- delta, 46
- depository receipts (DRs), 3
- Depository Trust Company, 3
- diligence, 150, 183
- disclosure of conflict of interest, 185
- disclosure of conflicts, 160
- discount rate, 79
- dissemination, 136
- duration, 46
- duties to clients, 133, 182
- duties to employer, 183
- duties to employers, 144

E

- efficient portfolio management, 9
- ex ante tracking error, 45, 49
- exchange-traded funds (ETFs), 1

exchange-traded notes (ETNs), 8
expectation-related risk, 9
ex-post tracking error, 49

F

factor risk premiums, 20
factor sensitivities, 20
fair dealing, 136, 182
fees and expense, 3
firewall, 130
front running, 163
fund accounting practices, 4
fundamental factor models, 22
fundamental law of active management, 105
fundamental law of active portfolio management, 100
fund closures, 8

G

gamma, 46
Grinold rule, 100
group research, 152

H

hedged portfolio, 63
hedge funds, 49
historical scenario analysis, 68
historical scenario approach, 45
historical simulation, 69
historical simulation method, 42
hypothetical scenario approach, 45

I

incremental VaR (IVaR), 44
independence and objectivity, 119
independent practice, 144
index changes, 4

- indicated NAVs (iNAVs), 6
- inflation-indexed bonds, 83
- information coefficient, 100
- information ratio (IR), 32, 97
- insurance companies, 50
- integrity of capital markets, 129
- inter-temporal rate of substitution, 80
- investment actions, 150
- investment analysis, 150
- investment banking relationships, 119
- investment policy statement (IPS), 138
- investment recommendations, 150
- investment universe, 59
- IPO, 137
- issuer-paid research, 120

K

- knowledge of the law, 116, 185

L

- leaving an employer, 144
- life insurers, 50
- look-ahead bias, 66
- lookback period, 41
- loyalty, prudence, and care, 133
- loyalty (to employer), 144

M

- macroeconomic factor models, 22
- marginal VaR (MVar), 45
- market manipulation, 131
- market timing, 102
- material nonpublic information, 129
- maximum drawdown, 65
- minimum lot size, 137
- misconduct, 126
- misrepresentation, 124
- Monte Carlo simulation, 42, 70

multifactor model, 22, 27

N

National Security Clearing Corporation (NSCC), 3

O

optimal active risk, 98

P

parametric method, 40

performance presentation, 140

phase of the business cycle, 85

point-in-time data, 65

portfolio insurance, 52

position limits, 51

preservation of confidentiality, 142

priority of transactions, 162

professionalism, 116, 185

property and casualty insurers, 50

R

real estate, 86

reasonable basis, 150, 183

rebalancing, 59

record retention, 157

redemption basket, 2

reference to CFA Institute, the CFA designation, and the CFA Program, 168

referral fees, 164

regulatory and tax requirements, 4

relative VaR, 45

reporting lag, 66

Responsibilities as a CFA Member or Candidate, 166

responsibilities of supervisors, 148

return attribution, 27

reverse stress testing, 48

risk aversion, 81

- risk budgeting, 51
- risk parity portfolio (RP), 60
- risk premium, 87
- rolling window backtesting, 62
- round-trip trading cost, 7

S

- sampling and optimization, 3
- scenario analysis, 45
- scenario limits, 51
- scenario risk measure, 47
- sector rotation, 103
- security lending, 8
- security selection, 102
- security selection return, 95
- sensitivity analysis, 45, 72
- sensitivity risk measures, 47
- settlement risk, 8
- Sharpe ratio, 97
- Shiller's CAPE, 86
- soft dollars, 134
- stale pricing, 6
- standardized sensitivities, 25
- Standards of Professional Conduct, 112
- statistical factor models, 22
- stop-loss limits, 51
- stress tests, 45
- styles, 61
- suitability, 137, 183
- surplus-at-risk, 50
- survivorship bias, 65

T

- tail dependence, 71
- Taylor rule, 82
- term spread, 83
- term structure of interest rates, 82
- third-party research, 151
- timing differences, 6
- tracking difference, 3

- tracking error, 3
- tracking portfolio, 30
- tracking risk, 28
- traditional (long-only) asset managers, 49
- transfer coefficient, 100
- travel, 120

V

- value added, 93
- value at risk (VaR), 39, 64
- variance-covariance method, 40
- vega, 46

W

- written consent, 147